Pit and Quarry

Published Every Other Wednesday for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and Other Non-Metallic Minerals.

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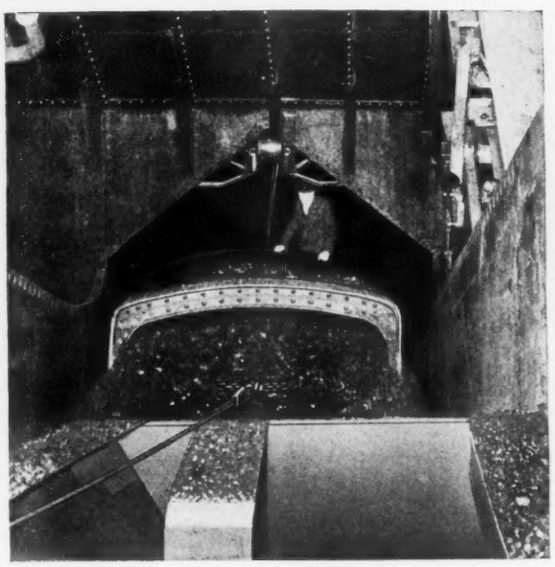
NEW ERA IN TRANSPORTATION MARKED BY USE OF SELF UNLOADING BOATS

Cement, Sand and Gravel, Crushed Stone, Coal, Etc., Handled Larger Tonnages Moved More Rapidly With Greater Economy

By H. W. Munday

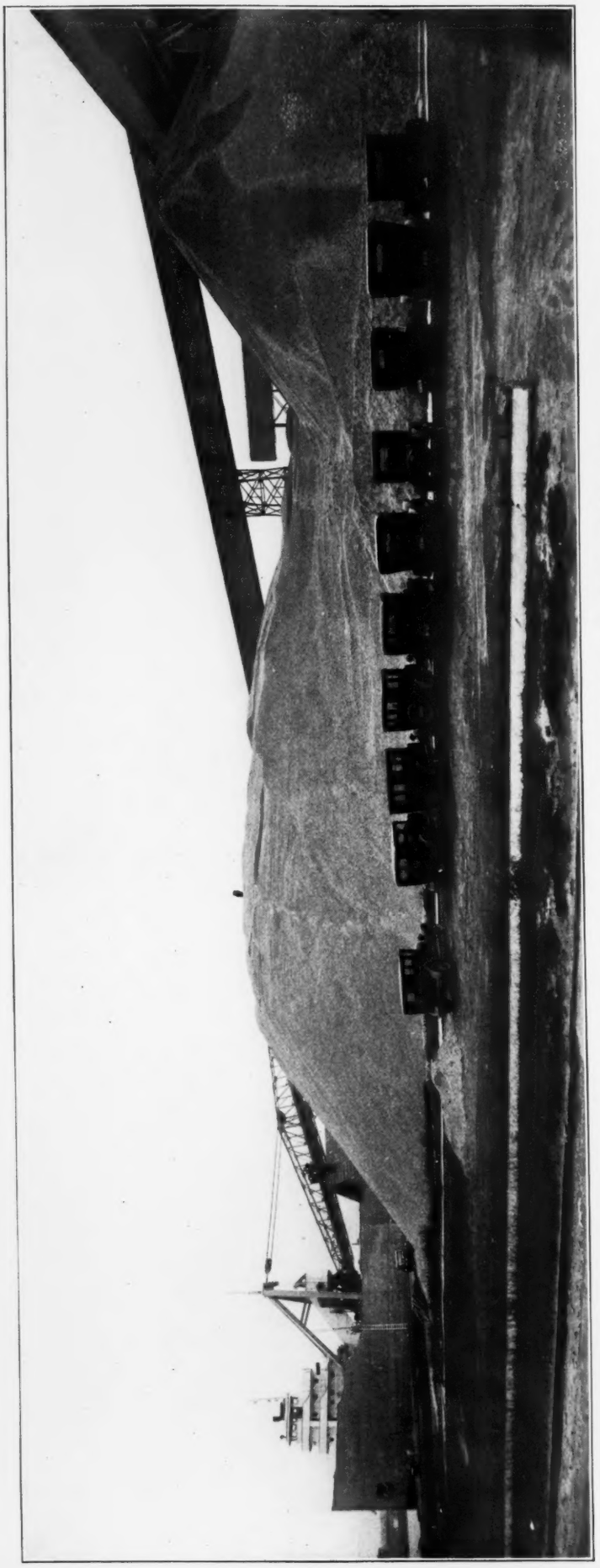
SELF unloading boats are being used more extensively for handling crushed stone, sand and gravel, cement, coal, etc., since the publication of the first article on these boats by Pit and Quarry on August 18, 1926. That article had to do with the operations of Leathem D. Smith and he has designed and built a number of boats since, several of which have entered service during the past year. The Huron Portland Cement Company was probably the pioneer in the operation of boats for handling crushed stone and cement. However, probably the Webster Manufacturing Company was the first to build a belt conveyor system for handling stone on boats when this use was made of belt conveyors by the Lake Shore Stone Com-

Self Unloading Boat Sand Merchant



Tunnel View Showing Scraper

Self Unloading Boat Sinaloa Discharging Its Cargo at the Materials Service Company's Dock in Chicago



Boat Discharging Cargo at Plant of New Egyptian Portland Cement Company

pany, of Milwaukee, Wisconsin.

Along with the development of the self unloading boat has come the growth and improvement of harbor facilities for handling the same materials. The Universal Portland Cement Company last year formally opened to navigation their Buffington Harbor. This substantial waterway improvement includes one of the largest fleets of freighters on the Great Lakes with self unloading boats that automatically discharge their load at the rate of a ton a second. The system also includes the largest movable boat unloading bridge in the Chicago District for unloading standard steamers, a million dollar storage yard, a mile long belt conveyor carrying material from the dock to the cement plant at the rate of six tons per minute, an 1800 foot concrete dock wall 600 feet wide that provides facilities at the same time for unloading limestone and loading cement for shipment, a 2000 foot breakwater and an all concrete lighthouse with an electric beacon visible 13 miles away.

Leathem D. Smith is well known among the crushed stone producers, as he owned and operated a large crushed stone plant at Sturgeon Bay, Wisconsin, which he sold last year to Dolomite Incorporated of Cleveland. It was while in the stone business that Leathem D. Smith developed his ideas for his first self unloading boats that were used in handling his own material. Success with his own material handling problem convinced him that a commercial field was open in the designing and building of such boats for general use. He was right and he sold out his stone business to give all his time to the development of his ideas. The Leathem D. Smith boats are now designed and built as units or old freighters are converted. In the Smith boats Sauerman dragline scrapers are employed in conjunction with a belt conveyor system. The principles are more or less standard. In the boats the Webster Manufacturing Company builds the design is not fixed and each boat is handled as a separate problem. Webster conveyors, Webster elevators, Webster feeders and Sauerman dragline scrapers are a definite part of the Webster scheme, however. Both Webster and Smith boats will be described.

Freight boats are operated like any business—to make a profit on the money invested. There are two main classes of boats, those carrying package and boxed

Two Self Unloaders Just Before Completion

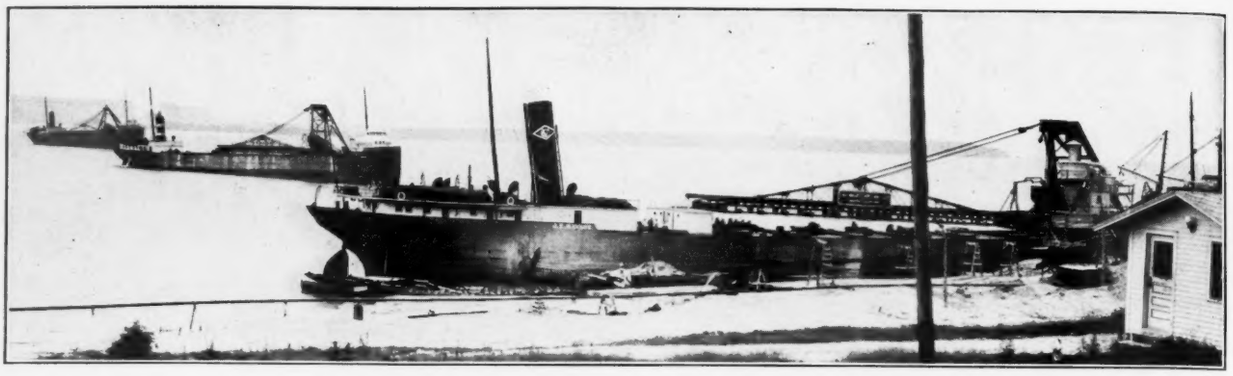
freight and those carrying bulk material such as coal, sand, stone, cement, ore, etc. The latter, or bulk freighters, are by far the more numerous and those in which most of us are interested.

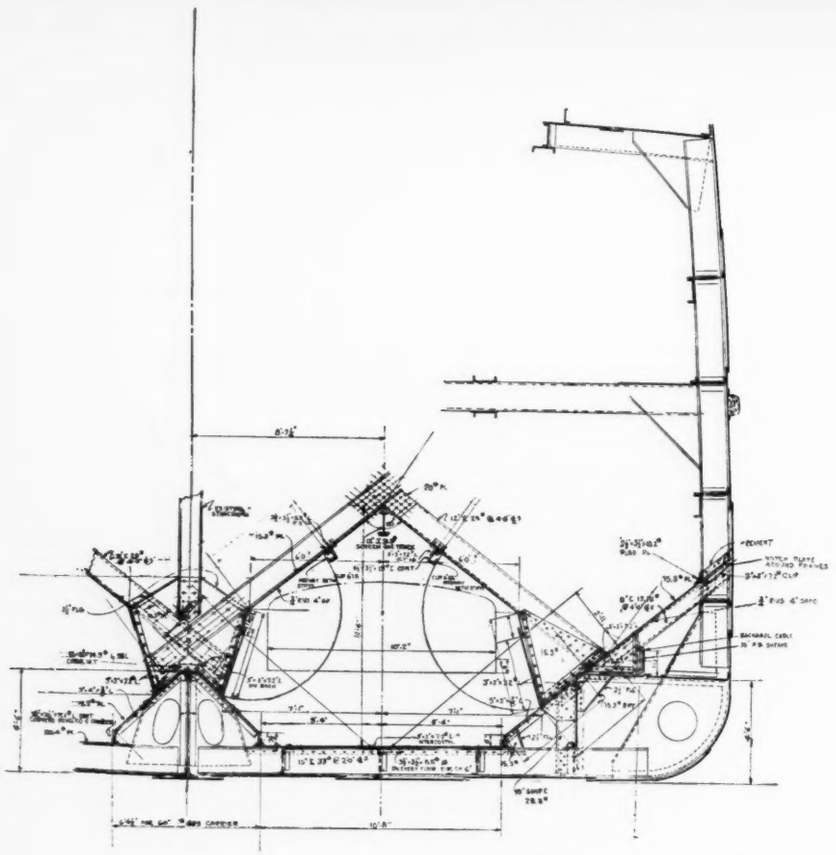
As in other industries, wages, fuel and other operating costs have gone up considerably. Thus the problem has been to handle the greatest possible tonnage and at the smallest cost per ton. As a result, all of the new freighters are made to handle large cargoes and are equipped with self unloading machinery. In this way the unloading time is decreased greatly with a corresponding increase in time actually spent in carrying cargoes.

These large new boats have made the old boats without unloading gear almost obsolete. However, many of these old boats still being fast and sound, the owners are converting them into self unloaders rather than operate upon too narrow a margin of profit.

With the self-unloading apparatus that has been

The Lakewood, Owned by the Buffalo Gravel Corporation, Handled Last Year 222 Cargoes in About 200 Days. It Is Also a Digging Boat

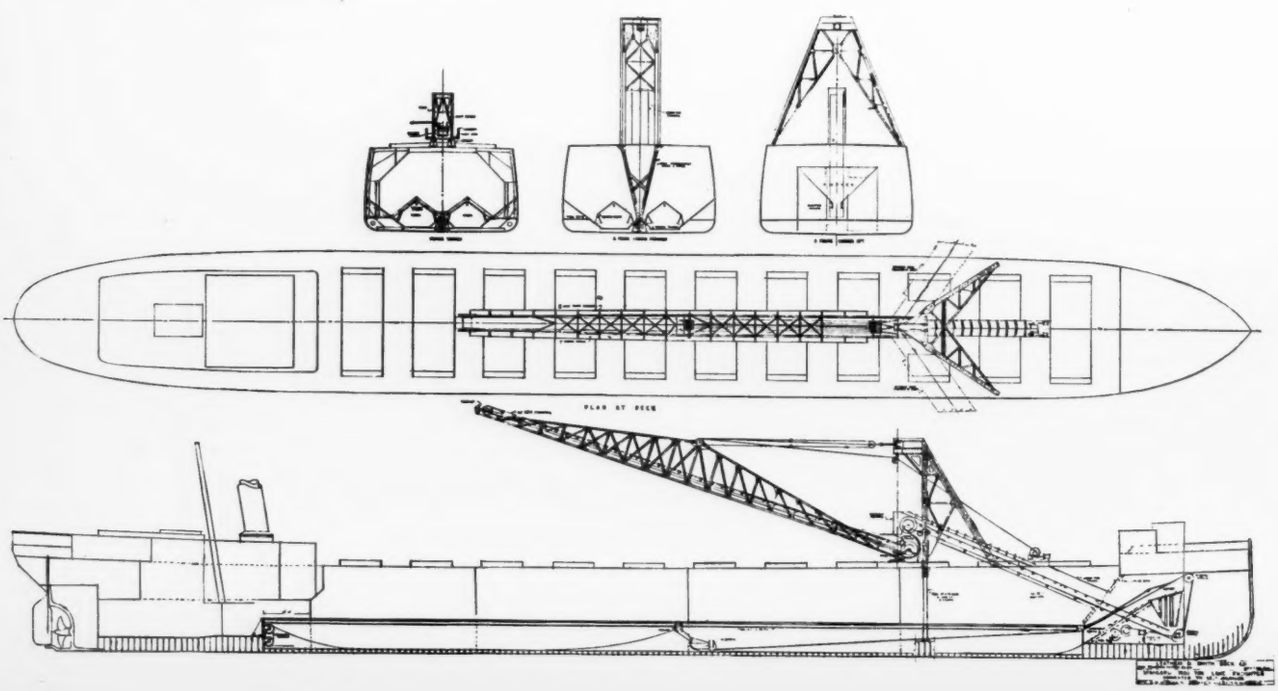




The upper view shows three self unloading boats in line.

The middle view is a midship section.

The lower view shows a plan view and side elevation of a Smith self unloading boat.

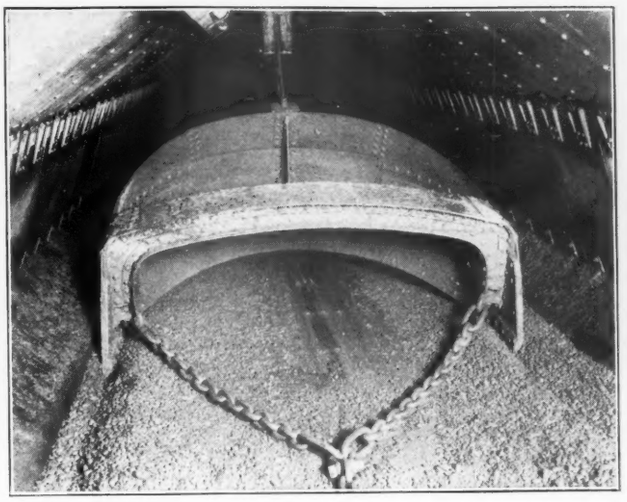


developed, the vessel can anchor at any point along the wharf or bank, swing a conveyor out over the shore, and discharge its cargo in a few hours. With a simple piece of material-handling equipment the cement, coal, stone, sand, ore, or whatever is being delivered, can be distributed from the large initial piles on to a ground storage area or delivered to the plant.

New boats built with unloading gear ordinarily employ two or more conveyors which operate under the cargo holds. The various compartments are hoppered at the bottom and the material is discharged on to the conveyors by gravity. The conveyors carry to one end of the boat where the load is elevated to a boom conveyor which can be swung over the side for discharge to cars or storage bins on the shore.

This system is very satisfactory and it is easy to work belt or pan conveyors into the bottom structure of new boats with very little loss of headroom. On the other hand, when an old boat is being converted the usual sub-cargo conveyors must be laid above the bottom frame work. The hoppered holds must be built above these to discharge on to the conveyors. When the boat is completed, not only has the cargo capacity been decreased but the center of gravity has been raised to the point where it might endanger the seaworthiness of the ship.

The Smith method is a new and very practical one of converting old boats into self-unloaders. The cost is comparatively low and very little cargo space is sacrificed to the sub cargo unloading machinery. Compared with the other method of converting old boats, Mr. Smith's patented method increases the capacity from ten to twenty per cent

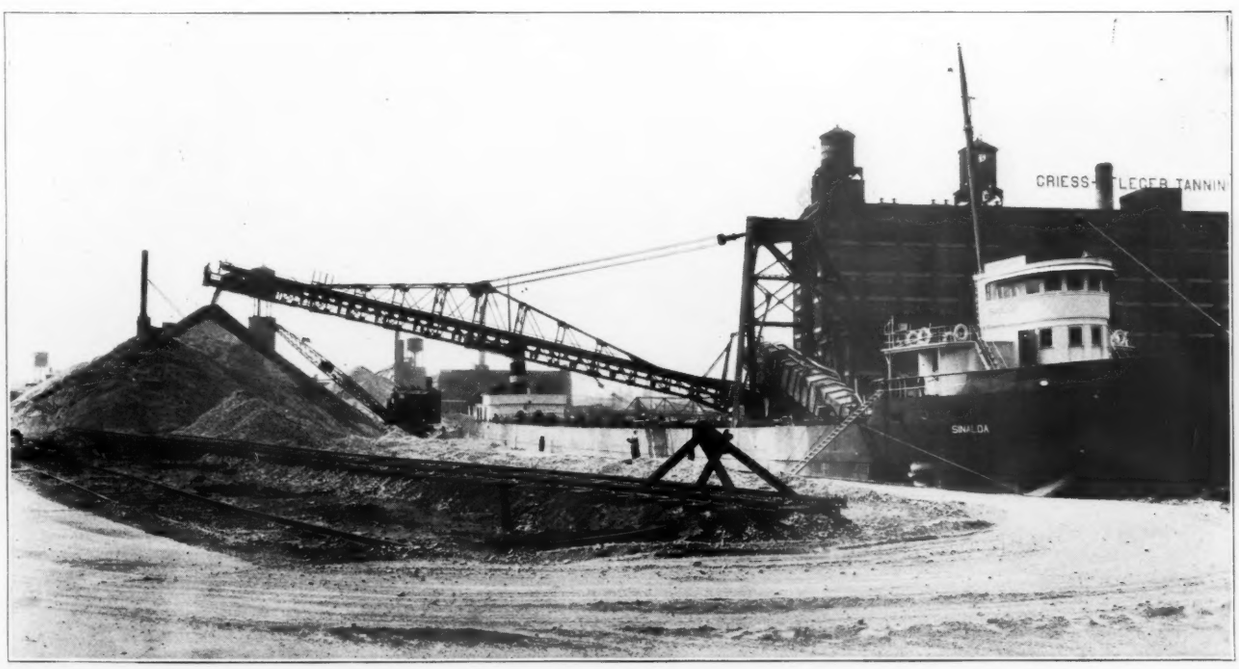


Close-Up of a Crescent Scraper in the Tunnel

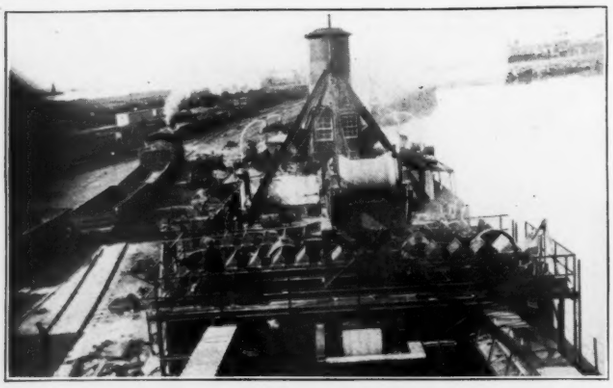
and lowers the center of gravity, sometimes as much as two or three feet.

Briefly, the Smith unloading arrangement consists of two or more longitudinal tunnels built into the bottom of the regular hold, with a Sauerman Crescent drag scraper operating forward and backward in each tunnel. The tops of the tunnels, the space between tunnels and the sides of the hold, are hoppered enough to make them self-cleaning. Hinged doors along both sides of each tunnel can be released, permitting the cargo to gravitate into the tunnels.

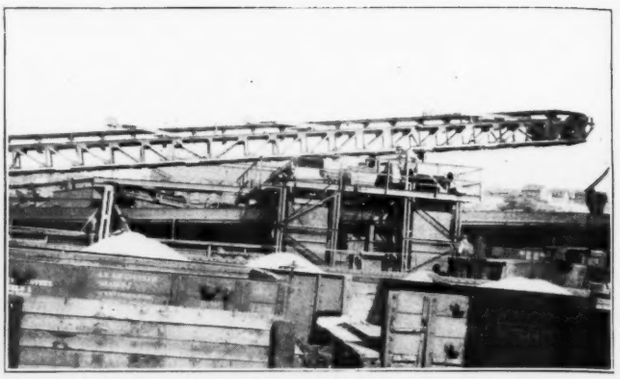
The scraper operating in each tunnel is a large scoop operating on a system of cables. When the scoop is being pulled backward, the rear is lifted, causing it to ride over the material which has fallen through the sides. As the scoop is pulled forward it digs down, pushing the material forward on the smooth steel floor until it is discharged



The Self Unloader Sinaloa Discharging in Chicago



Showing Bucket Elevator on the Sand Merchant



Conveyor on Sand Merchant Discharging Ten Cars

into a hopper feeding an inclined belt conveyor in the front of the boat. As the material in the tunnel is scraped forward, new material slides into the tunnel ready for the next trip of the scoop.

The inclined belt conveyor elevates and discharges the material on to the boom belt conveyor on the deck. This conveyor is mounted on a steel boom which can be swung out over the side of the boat and raised or lowered to a suitable discharge position.

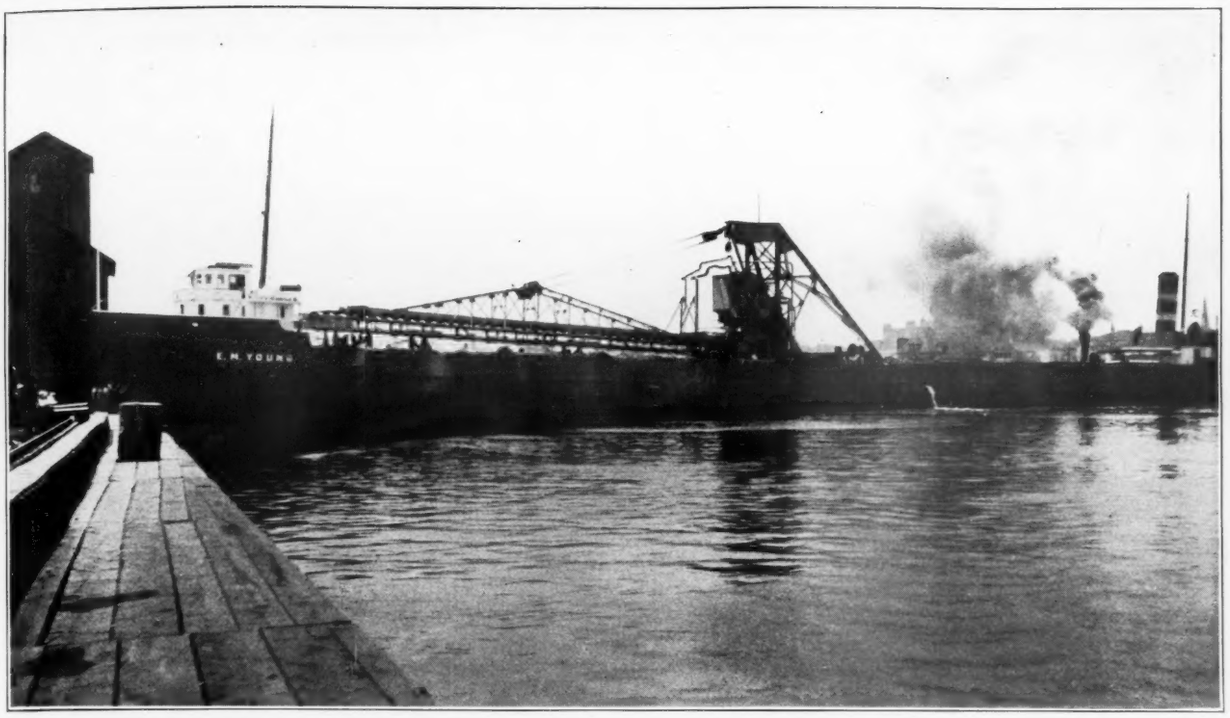
A number of Great Lakes freighters have been converted with this scraper type of unloading gear. Some of these are Bay State, Andanste, Clifton, Fontana, Way, Kennedy, Valley Camp, Lakewood, Savage, Sinaloa and E. M. Young. All of these have been equipped with Stephens Adamson conveyors, except the Lakewood, which is Link Belt equipped, and at the present time plans are being laid to convert two more boats and build one new vessel with this type of unloading equipment.

Of the above boats, the last three have just been completed. The J. E. Savage, (Thomas Britt) capacity 6,600 tons, length 410 feet, beam 48 feet, and depth 28 feet, has been equipped with the same apparatus as the Sinaloa, (Wm. Rapprich) capacity 6,800 tons, 416 feet long, 50 beam and 28 feet deep.

Work was started December 15, 1927, and they were converted in April, 1928, at a cost of approximately $2,000,000.00 each. The E. M. Young (formerly the Hoover & Mason) just finished, is probably the largest vessel ever converted to a self-unloader. It has a capacity of 9,500 tons, a length of 504 feet, beam of 54 feet, and its depth is 30 feet. The cost of converting was approximately $300,000.00.

The "E. M. Young" (formerly Hoover & Mason) is equipped with a new arrangement of the same unloading apparatus. Because of the length of the hold and to increase the capacity, the two longitudinal scraper tunnels are divided. Each tunnel

This View Illustrates Method of Discharge



View of the Largest Self Unloading Boat

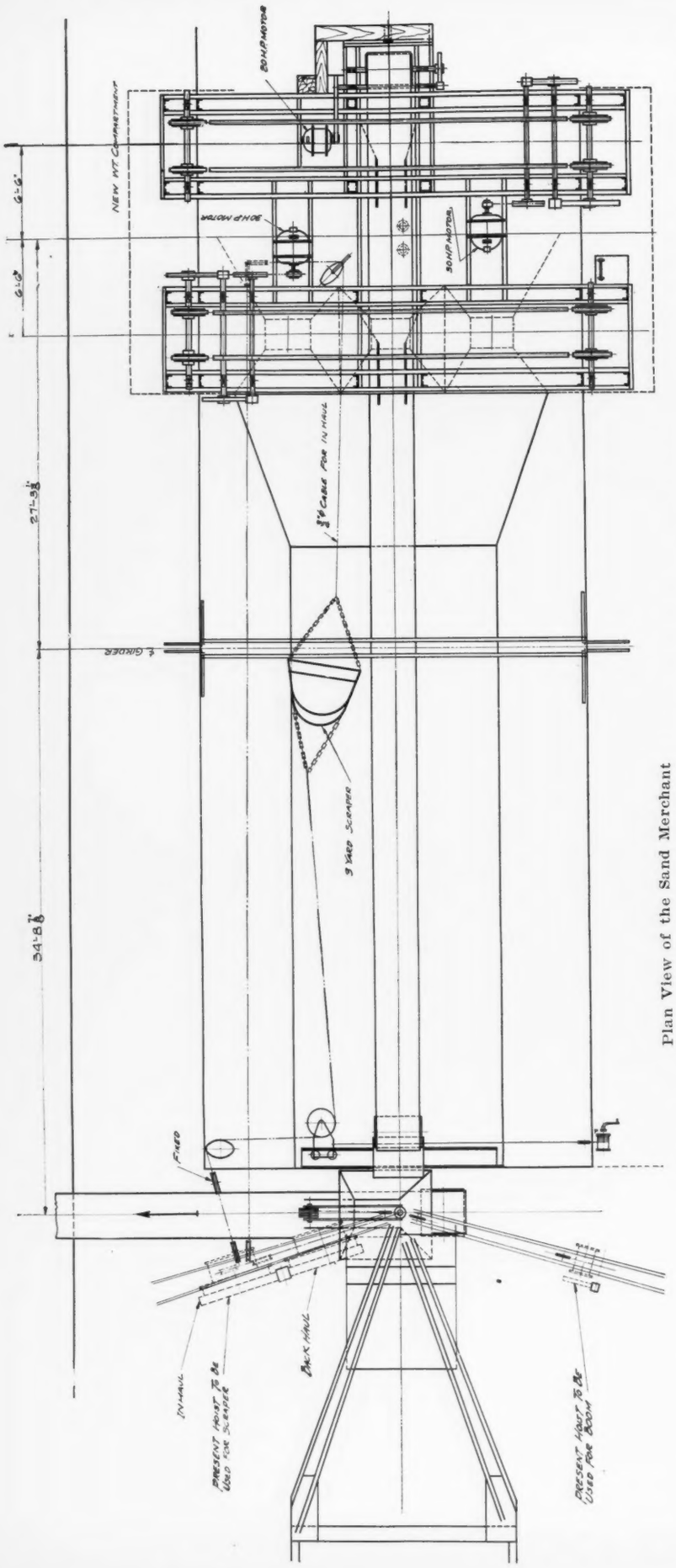
has two scrapers operating toward the center of the boat, the lengths being 172 feet forward and 126 feet aft. Thus four scrapers of 8 yards capacity each load the Stephens Adamson inclined fan conveyor (96 inches wide by 54 feet centers). This operates amidship, elevating to a Stephens Adamson belt conveyor on the boom. This belt conveyor is 60 inches wide by 150 feet long. The boat has a rated unloading capacity of 2,000 to 2,500 tons per hour.

The work was done at the Lorain plant of the American Shipbuilding Company. All the steel work and machinery installation was done by the shipyard while the machinery and the designs and pans are supplied by the Leathem D. Smith Dock Company. Due to the length of this vessel and the high rate of unloading desired, it was found advisable to use a 96 inch pan elevator located approximately amidship. This pan is fed by a cross hopper which in turn receives the material from four Sauerman 8 yard scrapers, two from the after end and two from the forward end of the ship. The length of the after tunnels is 126 feet and of the forward tunnels 172 feet, the elevator being so placed as to allow a 150-foot conveyor boom to be landed on the deck from the forecastle cabins aft. The boom conveyor has a 60 inch belt and the apparatus will have an unloading capacity of from 2,000 to 2,500 tons per hour.

Another new development on the Savage is the lowering of the tunnel floor down to the 15 inch floor frames which gives her a full capacity of about 6,200 tons. As the deadweight of this ship light has been increased approximately 400 tons by the installation of the unloading equipment the cubic space available for cargo will permit this vessel to load with coal to her full load draft. In lowering the tunnel floors to the bottom floor channels, additional angles were put on the backs of the latter and all riveted to the tunnel floor plates making a heavy box girder construction in the way of the tunnel.

The steamer Sinaloa is a vessel of 6,800 tons, 416 feet long, 50 feet in breadth and 28 feet deep. She is being equipped with the same type of apparatus for self-unloading as the Savage. Work on both vessels was done at the Leathem D. Smith Dock Company plant. Illustrations of this boat taken on August 9, 1928, accompany this article.

One new feature of the Sinaloa's equipment is that she is designed to handle bulk cement in addition to coal, stone, wet sand and other material handled by the other unloader boats. Bulk cement has peculiar characteristics which complicate the design of apparatus to handle it. Vessels designed to handle bulk cement on the Great Lakes have heretofore been specially built using a screw conveyor and air suction apparatus. Naturally such vessels are limited to the handling of cement being unable to handle lump or abrasive materials. The only change in the Sinaloa equipment over that of the Savage is the installation of small openings about 12 inches in diameter in the large doors in the tunnel. Bulk cement thoroughly compacted will stand vertically, but when it starts to move and becomes aerated, it has an extremely flat angle of repose, spreading out freely in every direction. On this account it was deemed advisable to install small door openings to check the flow of cement to the tunnels under the full pressure of the cargo.



Plan View of the Sand Merchant

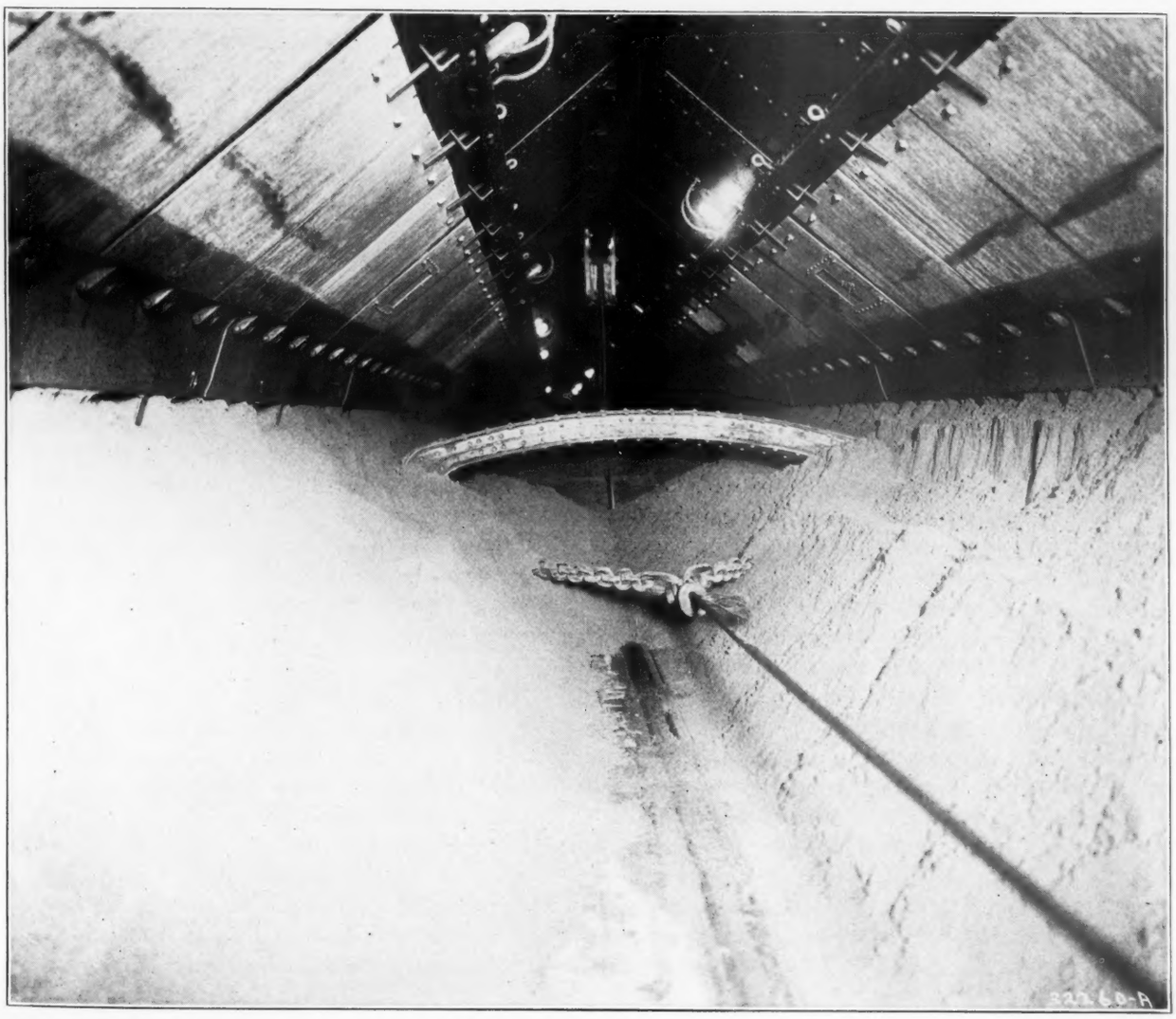
The tunnel inclined sides are canvas curtained to keep the dust from hoisting machinery and operator. Where the cement is fed from the scraper hopper to the inclined belt, canvas curtains and air vents are fitted to prevent the blowing out of dust into the machinery space. The boom conveyor is to be covered with canvas which will be used while handling cement and removed for other cargo. Both the Savage and the Sinaloa have "A" frames designed to permit the conveyor boom to swing 30 degrees ahead of amidships. This is of particular advantage in discharging material in dead end slips because it permits the vessel to land the cargo at any point up to almost abreast of the vessel's stem.

The "Savage" and "Sinaloa" each have an unloading capacity of 1,300 tons per hour and each boat is equipped with two 10 yard crescent scraper conveyors 140 feet long under the holds. Each boat has one inclined belt conveyor. These conveyors are equipped with Number 66 Stephens Adamson belt conveyor carriers and in each case elevate the material up to the 54 inches wide by 140 feet long boom conveyors on the deck. These belt conveyor booms are lashed fast to the deck except while discharging cargo, when they are swung to any position outboard.

Of the earlier steamers fitted with the scraper unloading machinery, the Valley Camp is of particular interest because it was built in England for the Valley Camp Steamship Company. The contractors were Swan, Hunter and Wigham Richardson, Ltd., Newcastle-on-Tyne. The Leathem D. Smith system was installed on the boat at the time she was being built. After being tested in England she was sailed to her destination on the Great Lakes with a cargo of coke.

The Valley Camp has a total length of 252 feet, a 43 foot beam, and a draft, with a cargo of 2,000 tons deadweight, of a little over 14 feet. She is equipped with two 4 yard, "Crescent" scrapers, a 48 inch inclined conveyor and a boom conveyor of the same width and 85

Showing Method of Discharging Bulk Material in Use by One Boat



Scraper Starting Its Haul in the Tunnel of the Sinaloa

Leathem D. Smith Is at Right Looking Over One of His Boats

feet long. Her unloading capacity is 600 tons an hour.

The ship has three holds, each with several hatches for rapid loading. There are three longitudinal tunnels extending full length of the holds. The two main tunnels cover the scrapers while the smallest houses the return cables for both scrapers. It is estimated that the tunnel construction of this ship permits a capacity of approximately 15 per cent more than possible if she had been converted with holds entirely above the usual conveyor line. In addition, the tunnels may be fitted with watertight doors at bulkheads, as required by insurance regulations.

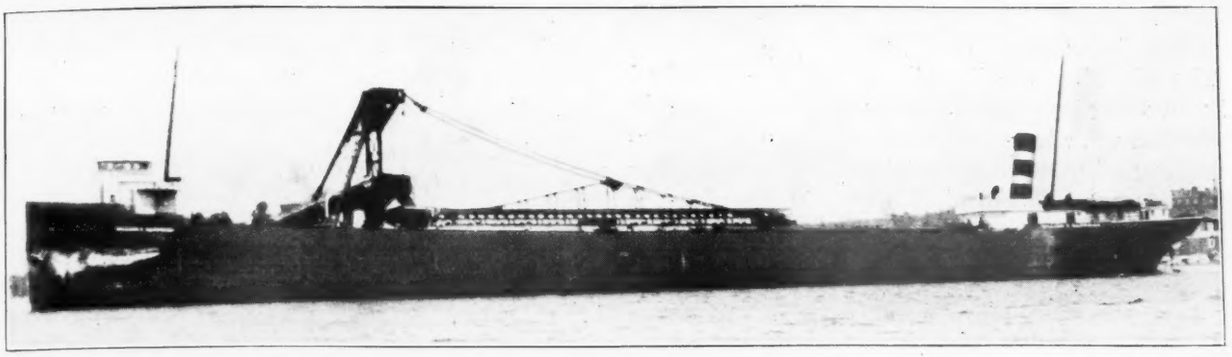
The scrapers discharge into a hopper between, which in turn feeds a 48 inch by 80 foot belt conveyor. The boom belt conveyor is 48 inches wide by 83 foot centers. It is mounted upon the steel boom structure shown. The total length is 85 feet, and it can be swung outboard to discharge at a maximum distance of 62 feet from the ship's side. The maximum elevation of 22 degrees gives a discharge height of about 30 feet above the deck level.

The Stephens Adamson belt conveyor on the boom is equipped with Style 66 troughed carriers and is somewhat unusual in that at the pivot end, where the load is received from the hold, the belt is dipped slightly. This permits a better loading condition when the conveyor is being operated at its maximum elevation. The drive is, of course, at the pivot end of the conveyor and the steam is piped to permit the boom to be slewed through two-thirds of a circle.

All hoists and conveyors on these three boats are driven by steam engines, the use of which gives a very flexible control over the capacity handled. In addition, the engines and unloading equipment can be handled by the regular operating crew of the ship's engineer. The hoist for raising and lowering on these ships is a standard Clyde worm driven unit. It is equipped with reversing piston valves giving smooth and positive operation. The worm drive is self locking and in addition a positive post type of brake is supplied for additional safety. The engines are also Clyde units and are equipped with outside valve motion, piston type valves with adjustable rings for positive seating.

During one season (about eight months) one large boat traveled 42,000 miles, stopped at 87 ports and spent 3,628 hours of actual time on the lakes. The boat carried 81 loads during the season and these were divided as follows: coal, 33 loads; stone, 31, and sand, 17. The unloading time for the boat averaged 7 or 8 hours for coal, up to 11 or 12 for sand. This did not include the time spent in washing out the hold when a change in cargo was made.

The Bay State, operated by Smith Truby Sand Company, has a 2,500 ton cargo capacity. It digs its own cargo from the lake bottom with an 18 inch Amsco centrifugal pump. It is equipped with Smith's patented dewatering boxes allowing boat to be loaded without putting free water into hold and hauls torpedo sand to Detroit, Cleveland and Buffalo. Two Sauerman 4 yard scrapers are used for unloading. The boat loads in 3 to 6 hours, depending on conditions and unloads in 5 to 6 hours. The Bay State last year handled 175 cargoes in the 200 day season, with a total tonnage handled of about 400,000 tons. It covered a fifty mile haul



A Full View of One Self Unloader

each day, in addition to handling each cargo twice.

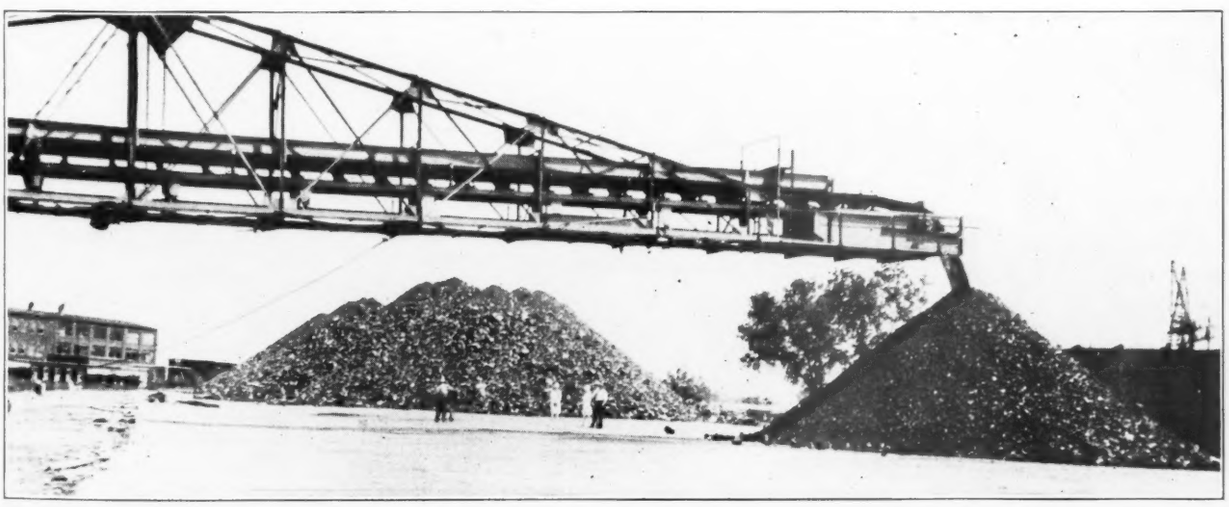
The J. M. Kennedy, last year handling 82 cargoes of 5,000 tons each, ran 42,000 miles during 220 days of operation, or 500 miles to cargo. Conveying boat only, operated by Valley Camp Steamship Company, carrying crushed stone from Sturgeon Bay, torpedo sand from the Ontario Sand & Gravel Company (Sarnia, Ont.), crushed trap rock from Mountain Stone Company (Ft. William, Ont.), and foundry sand from Port Crescent Sand Company, —as well as coal for the Valley Camp Coal Company.

With ships having cargo holds up to 150 feet long and a deadweight capacity of 2,000 to 3,000 tons, Sauerman scrapers of 4 yard size are ordinarily used. Larger vessels from 3,000 to 6,000 tons deadweight capacity, with holds up to 250 feet long, are fitted with 8 yard scrapers, which will handle either 6 tons of coal or 10 tons of stone.

The John McCarthy Kennedy Discharging Coal at the Rate of 1,000 Tons Per Hour

Still larger boats are equipped with scrapers of 10 cubic yard size, and the largest vessel yet outfitted, with a tonnage of 9,500 tons, has four scrapers with a capacity of 8 yards each.

The speed of the loaded scraper varies, according to the nature of the cargo and the length of the tunnel, from 200 to 250 feet per minute. The

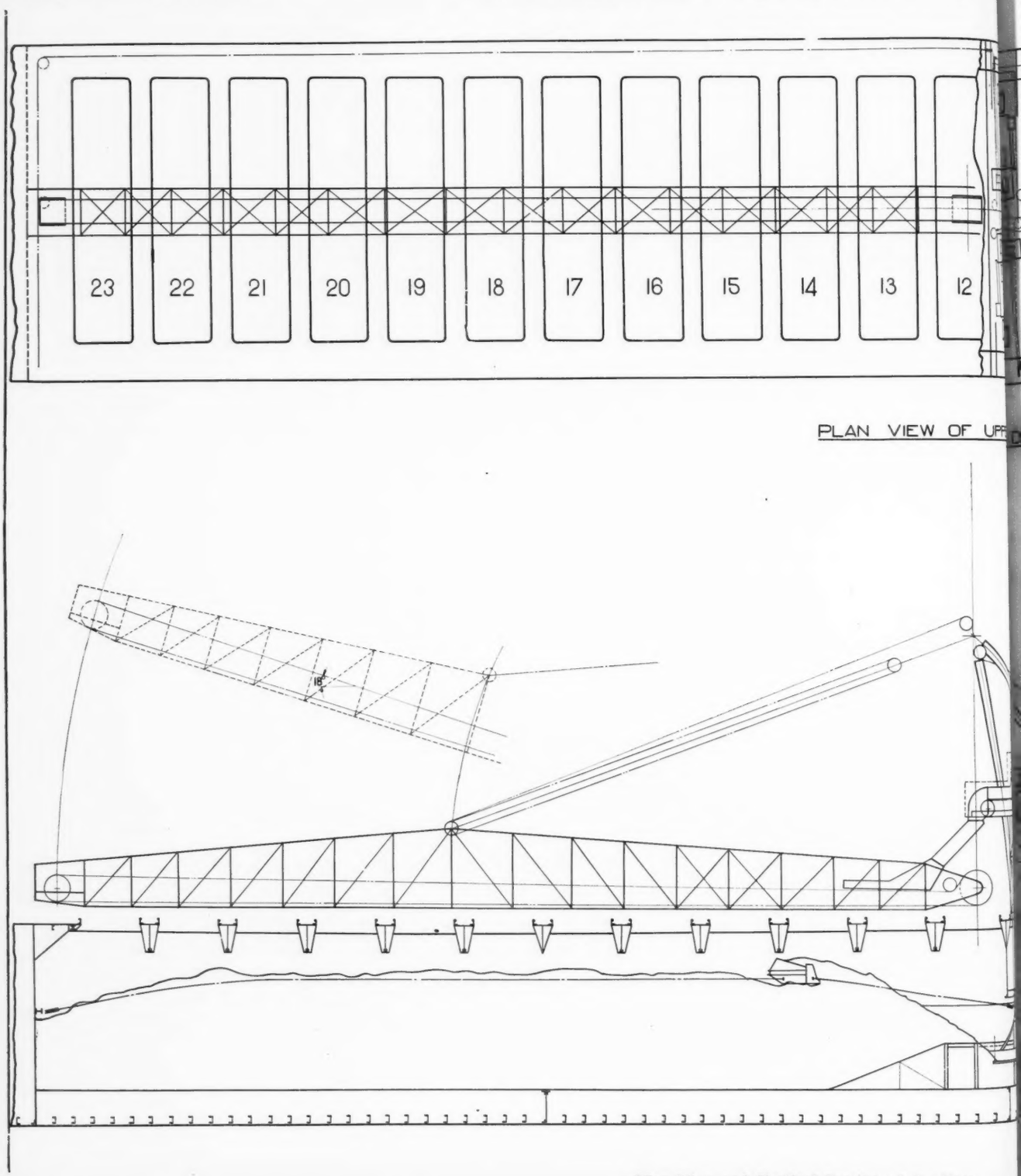


Close-Up of a Conveyor Form Piler as It Discharges

backhaul speeds of the empty bucket are from 400 to 500 feet per minute.

The advantages of the sub-cargo scraper method of unloading equipment, either intrinsically or as compared with tunnel belt conveyors or other systems, are of many different kinds. The following advantages have been enumerated in descriptions and comments by engineers. These advantages have been demonstrated by the test of actual service, which has proved the practical correctness of the design and construction:

(1) If the tunnel floors are placed as low as possible, very little cargo space is sacrificed to the unloading machinery. The tunnels are simpler and smaller than for belt conveyors, and loading is from the side instead of the top—an underfeed instead of an overfeed. It is estimated that a boat with scraper equipment has 15 per cent greater cargo capacity than with belt conveyors. The stability and seaworthiness of the vessel is increased by lowering the center of gravity about 2 feet,



Plan View and Vertical Section of the New

whereas belt conveyors raise the center of gravity 5 feet or more.

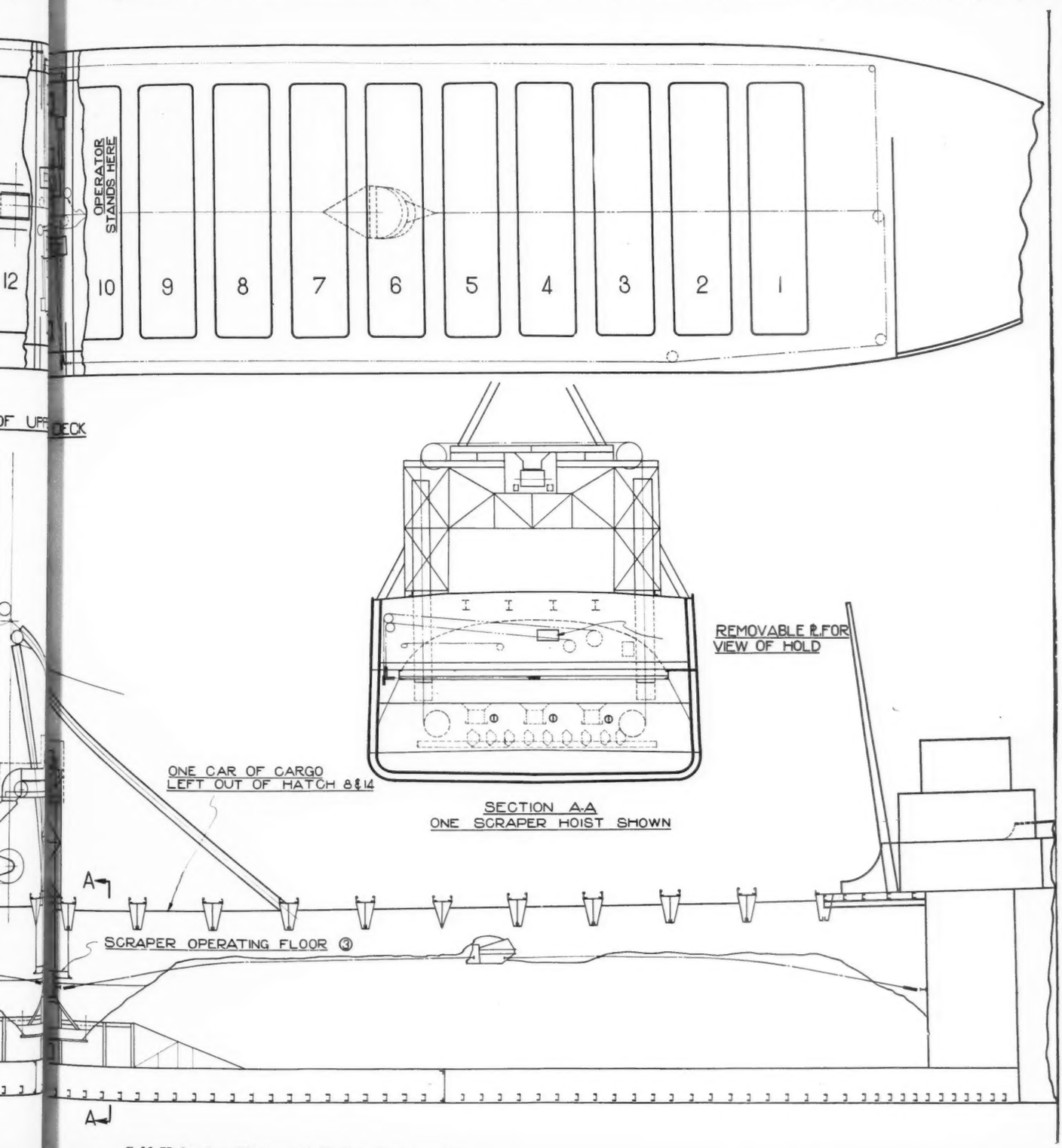
(2) Simplicity of construction of the tunnels adds greatly to the strength of the ship.

(3) For sea-going ships and from the standpoint of sea-worthiness in general there is the advantage that the use of scrapers does not interfere with fitting watertight doors in the tunnels at the bulkheads, as required by insurance regulations.

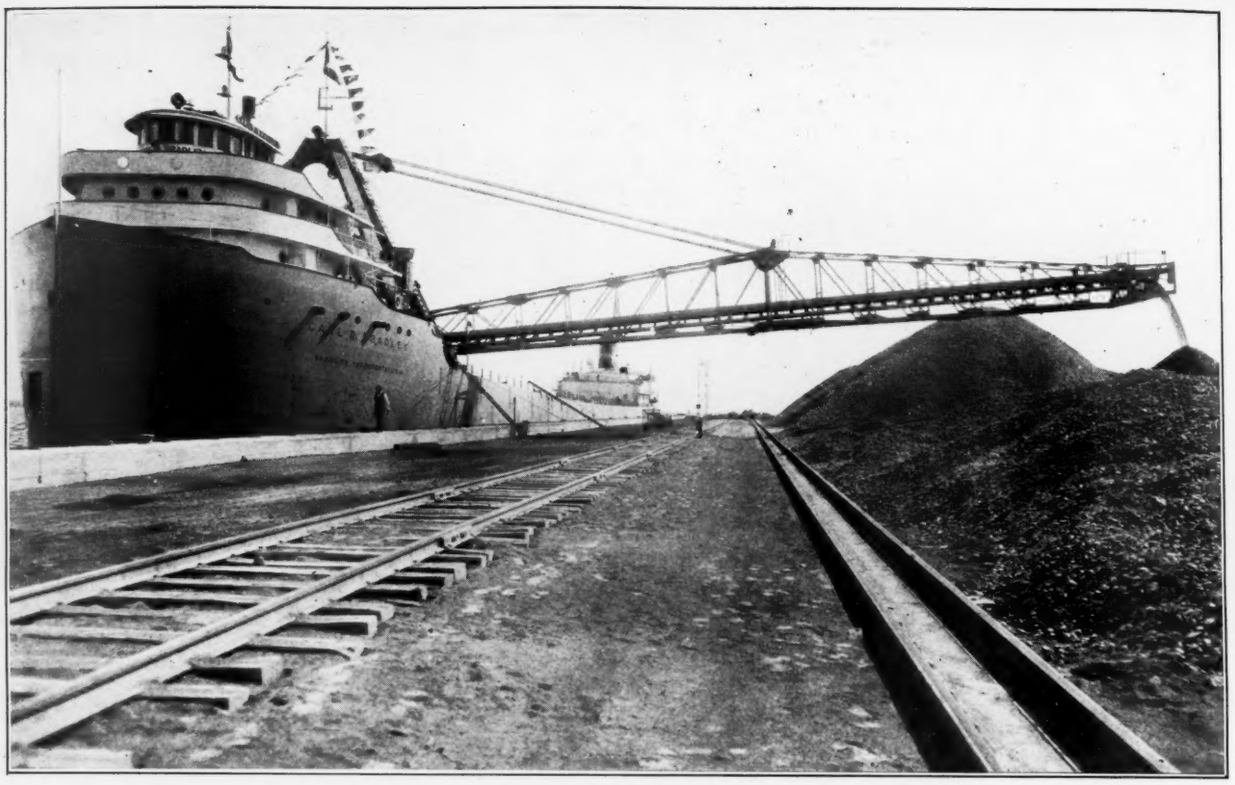
(4) The low position of the cargo and the comparatively limited headroom required makes it possible to apply this type of self-unloader for shallow draft operation and under limited bridge clearances.

(5) The design of the tunnels permits ideal drainage for wet cargoes.

(6) Because of the ample tunnel openings and hoppered construction of the bottom of the hold, vessels with this type of unloading equipment are used effectively for handling such sluggish and non-free-flowing materials as fine wet coal, wet sand and ore, which with a belt conveyor plant



Self Unloader Fitzgerald Under Construction



One of the Bradley Transportation Company Boats Discharging

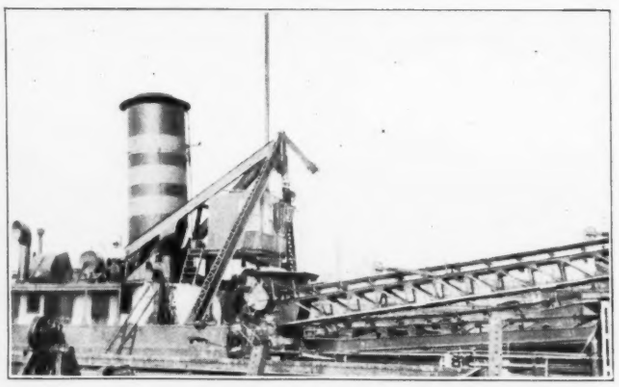
Looking Into One of the Tunnels

often require much hand work to get them through the hoppers in the bottom of the holds.

(7) The size of openings of the tunnels are not restricted by any danger of flooding these spaces with material, making it possible to handle large slabby angular material. Designs have been worked out to handle stone up to 500 pound pieces.

(8) Breakage, as in the case of large coal, is reduced to a minimum.

(9) There is a minimum of working parts and their operation is simple. The first cost is comparatively low and vessels so outfitted have been operating with low maintenance cost.



Showing the A Frame for Swinging on the Sand Merchant

The Sand Merchant, operated by the Interlake Transportation Company, is a converted ship with a capacity of 2210 cubic yards, of Webster Manufacturing Company design. It has features different from the Smith boats. Two 3 yard Sauerman scrapers bring the material to a Webster designed hopper with 3 gates. From this hopper the material is picked up by two Webster V shaped bucket elevators with 24 by 36 inch buckets each with a capacity of 400 tons per hour at a speed of 100 feet per minute. The material is elevated 25 feet and carried over 16 feet to a Webster feeder belt with a 60 foot hinged section that delivers the material to the Webster boom belt which is 100 feet centers and discharges the cargo at the rate of 800 tons per hour at 400 feet per minute.

Lidgerwood and Flory hoists are used for swinging on this boat. A feature of this boat is that the

tail sheave on the scraper system can be moved the width of the boat, permitting it to be thoroughly cleaned by the scrapers. The cubical carrying capacity of this boat is unusually large. The boat carries crushed stone, sand, gravel, coal, etc.

The Webster Manufacturing Company has designed a boat for D. Sullivan and Company that uses only one elevator which is placed in the center of the boat and is fed from both ends by Sauerman scrapers. A complete description of this boat will be published in an early issue of Pit and Quarry. A plan view of the upper deck and a side elevation is illustrated in this article which shows some of the unusual features.

These self unloading boats have a performance record behind them that indicates a much more extensive use of their facilities, and in our annual hydraulicking and dredging number of 1929 we shall report the progress made and any new developments.

Record July Construction

July construction contracts in the territory east of the Rocky Mountains reached a total of $583,432,400, according to F. W. Dodge Corporation. The area covered in this record consists of 37 states and includes about 91 per cent of the total country. The above figure was the highest July contract total on record. It was 9 per cent ahead of the total for the same month of last year, but there was a drop of 10 per cent from the total for June of this year.

Last month's record brought the total amount of new building and engineering work started since the first of this year up to $4,028,299,900, establishing a new high record for new construction contracted for during the first seven months. The increase over the first seven months of 1927 was 8 per cent.

Analysis of the July building record showed the following outstanding items: $228,734,800, or 39 per cent of the total, for residential construction; $137,074,700, or 23 per cent, for public works and utilities; $95,696,800, or 16 per cent, for commercial buildings; $36,926,400, or 6 per cent, for educational projects; and $31,399,800, or 5 per cent, for industrial projects. New work contemplated in the 37 states during the past month reached a total of $647,682,700, being a loss of 37 per cent from the amount reported in the preceding month and a drop of 7 per cent from the amount reported in July of last year.

New York—Northern New Jersey

Contracts let on new building and engineering work in New York State and Northern New Jersey during July reached a total of $137,685,000. This figure was 22 per cent less than the June 1928 record and it was 12 per cent under the total for July of last year. Included in last month's construction record were the following outstanding items: $71,955,300, or 52 per cent of all construction, for residential buildings; $25,055,600, or 18 per cent, for public works and utilities; $18,155,000, or 13 per cent, for commercial buildings; and $10,975,500, or 8 per cent; for educational projects.

Contemplated projects as reported last month in New York State and Northern New Jersey amounted to $173,989,300. There was a drop of 47 per cent from the amount reported in the preceding month and there was a 12 per cent loss from the July 1927 total.

New England States

The New England States had a total of $36,592,400 for new construction during the month of July. The above figure was 17 per cent in excess of the July 1927 total, but there was a drop of 11 per cent from the total for June of this year. Analysis of the July building record showed the following important classes of work: $15,600,500, or 43 per cent of all construction, for residential buildings; $5,732,100, or 16 per cent, for public works and utilities; $3,983,000, or 11 per cent, for industrial projects; and $3,385,300, or 9 per cent, for commercial buildings.

Middle Atlantic States

New construction started in the Middle Atlantic States (Eastern Pennsylvania, Southern New Jersey, Maryland, Delaware, District of Columbia and Virginia) last month, amounting to $62,212,100 was the highest July contract total ever recorded for this district. It was 16 per cent ahead of the July 1927 total, but there was a loss of 19 per cent from the June 1928 total. The following were the most important items in the July building record: $25,333,400, or 41 per cent of all construction, for residential buildings; $15,951,500, or 26 per cent, for public works and utilities; $8,462,500, or 14 per cent, for commercial buildings; and $3,663,700, or 6 per cent, for social and recreational projects.

Pittsburgh District

July construction contracts amounted to $64,361,600 in the Pittsburgh District (Western Pennsylvania, West Virginia, Ohio and Kentucky). Last month's total was 18 per cent under that for June of this year and was 4 per cent less than the total for July of last year. Analysis of the above figure showed the following items of note: $23,255,600, or 36 per cent of all construction, for public works and utilities; $19,671,300, or 31 per

cent, for residential buildings; $6,113,100, or 9 per cent, for industrial projects; $5,178,200, or 8 per cent, for educational projects; and $5,122,200, or 8 per cent, for commercial buildings.

Total building and engineering work started in these states during the first seven months of this year amounted to $430,555,100, which was a drop of 9 per cent from the total for the first seven months of last year.

New work contemplated in the Pittsburgh District during the past month reached a total of $89,920,500. This figure was 64 per cent ahead of the July 1927 total, but there was a 6 per cent decrease from the total for June of this year.

Central West

New construction started in the Central West (Illinois, Indiana, Iowa, Wisconsin, Southern Michigan, Missouri, Kansas, Oklahoma and Nebraska) in July, amounting to $201,981,400 was the largest monthly total ever recorded in this territory. It was 5 per cent ahead of the June 1928 record and was 35 per cent in excess of the July 1927 total. The awarding of two large projects, a $30,000,000 one in the commercial class and a $12,000,000 one in the residential class helped to make last month's total a record breaking figure.

Analysis of the July building record showed the following items of note: $72,664,600, or 36 per cent of all construction, for residential buildings; $49,746,900, or 25 per cent, for commercial buildings; $44,414,800, or 22 per cent, for public works and utilities; and $11,421,400, or 6 per cent, for industrial projects.

Last month's contract total brought the amount of new building and engineering work started in this district since the first of this year up to $1,217,766,000, being 19 per cent ahead of the total for the corresponding period of 1927.

Contemplated projects as reported last month in the Central West reached a total of $156,559,200. This figure was just a little less than half the total for June of this year and it was 7 per cent less than the total for July of last year.

Northwest

New building and engineering work contracted for in the Northwest (Minnesota, the Dakotas and Northern Michigan) during the past month reached a total of $8,604,700. There was an increase of 11 per cent over the total for June of this year but there was a loss of 24 per cent from the total for July of last year. Included in last month's building record were the following: $2,622,100, or 31 per cent of all construction, for public works and utilities; $1,665,500, or 19 per cent, for residential buildings; $1,261,100, or 15 per cent, for commercial buildings; and $835,000, or 10 per cent, for hospitals and institutions.

During the first seven months of this year there was $43,783,000 worth of new construction work started in the Northwest, which was a drop of 18 per cent from the amount started during the first seven months of 1927.

New work contemplated in this district during July amounted to $8,463,100, being a loss of 4 per cent from the amount reported in the preceding month and a drop of 36 per cent from the amount reported in July of last year.

Southeastern States

July construction contracts in the Southeastern States (the Carolinas, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas and Louisiana) amounted to $52,791,400. Last month's record was 2 per cent ahead of the June 1928 figure and 20 per cent ahead of the July 1927 record. Analysis of the July building record showed the following important classes of work: $15,820,800, or 30 per cent of all construction for public works and utilities; $14,486,300, or 27 per cent, for residential buildings; $7,010,900, or 13 per cent, for commercial buildings; and $4,680,700, or 9 per cent, for industrial projects.

Total building and engineering work started in the Southeastern States during the first seven months of this year amounted to $345,625,700, a drop of 3 per cent from the amount contracted for during the first seven months of last year.

Contemplated projects reported last month in this territory reached a total of $60,797,500, being a gain of 16 per cent over the amount reported in the preceding month and an increase of 4 per cent over the amount reported in July 1927.

Texas

Texas had $19,203,800 in contracts for new building and engineering work during the past month. There was a 27 per cent decrease from the record of June 1928 and there was a drop of 6 per cent from the figure for July of last year. The following were the most important items in the July building record: $7,357,900, or 38 per cent of all construction, for residential buildings; $4,222,200, or 22 per cent, for public works and utilities; $2,552,900, or 13 per cent, for commercial buildings; and $2,071,200, or 11 per cent, for social and recreational projects.

During the first seven months of this year there was $148,425,000 worth of new construction work started in this state, as compared with $135,727,800 for the corresponding period of last year, the increase being 9 per cent. New work contemplated in Texas during July amounted to $29,442,100. This figure was 5 per cent ahead of the total for June 1928, but was 36 per cent under the July 1927 total.

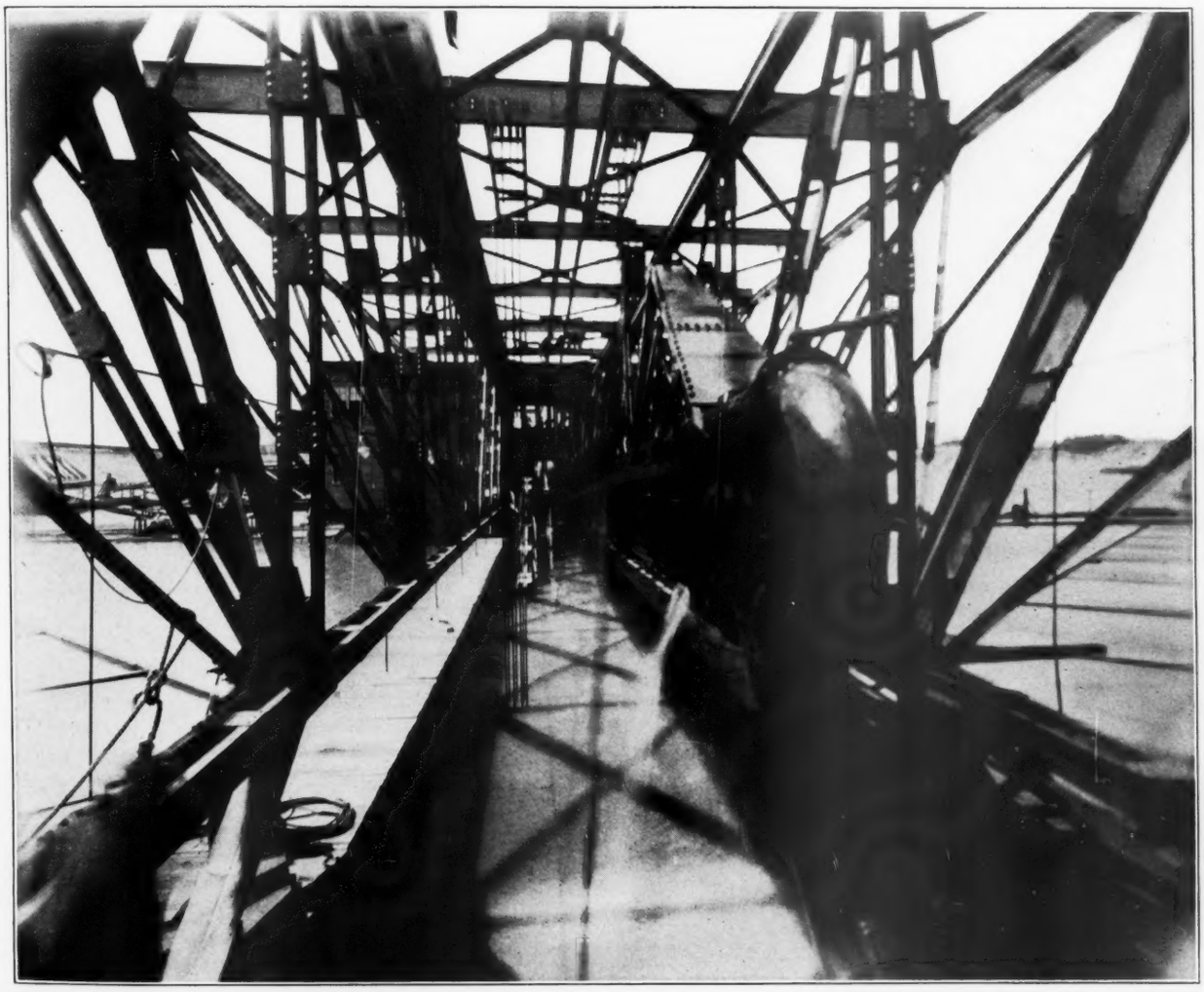
WARD'S PUMPING SYSTEM PERFECTED

By H. W. Munday

ENGINEERS have known of the hydraulic elevator for many years and the generally accepted opinion was that the principle was inefficient and could only be used to advantage where a large supply of pressure water was available. In the early days of California the device was used with varying degrees of efficiency and not in any case more than 25 per cent which is only about half that of a centrifugal dredging pump. The hydraulic elevator as used consisted of a cylinder with a pressure nozzle at the bottom directing a jet of high pressure water upward through the center of the cylinder. A contracted manganese steel throat was built into the cylinder just a few feet above the nozzle so that the jet as it spread filled the orifice in the throat. This action created a vacuum in the cylinder between the nozzle and the throat which pulled the material to be excavated into the chamber and discharged it through the constricted throat. This system was generally accepted to be the least efficient method of excavating sand and gravel on a large scale when Mr. F. L. Ward started experimenting with this so called hydraulic elevator at his sand and gravel plant in Oxford, Michigan. Mr. Ward convinced himself that he could apply some new original applications to this old principle with success to his own plant.

In 1925 Mr. Ward installed his invention in his own plant and based all his sand and gravel production on his own development of this so called hydraulic elevator. The writer made a personal visit to Oxford during the summer of 1925 and was surprised to find this system producing 200 cars of material daily. After a careful check up all doubt disappeared. We knew F. L. Ward had something then and felt that he could improve his invention to perform to complete satisfaction. The first published description of what F. L. Ward was doing appeared shortly after in the August 15, 1925, issue of Pit and Quarry.

A number of engineers questioned the article

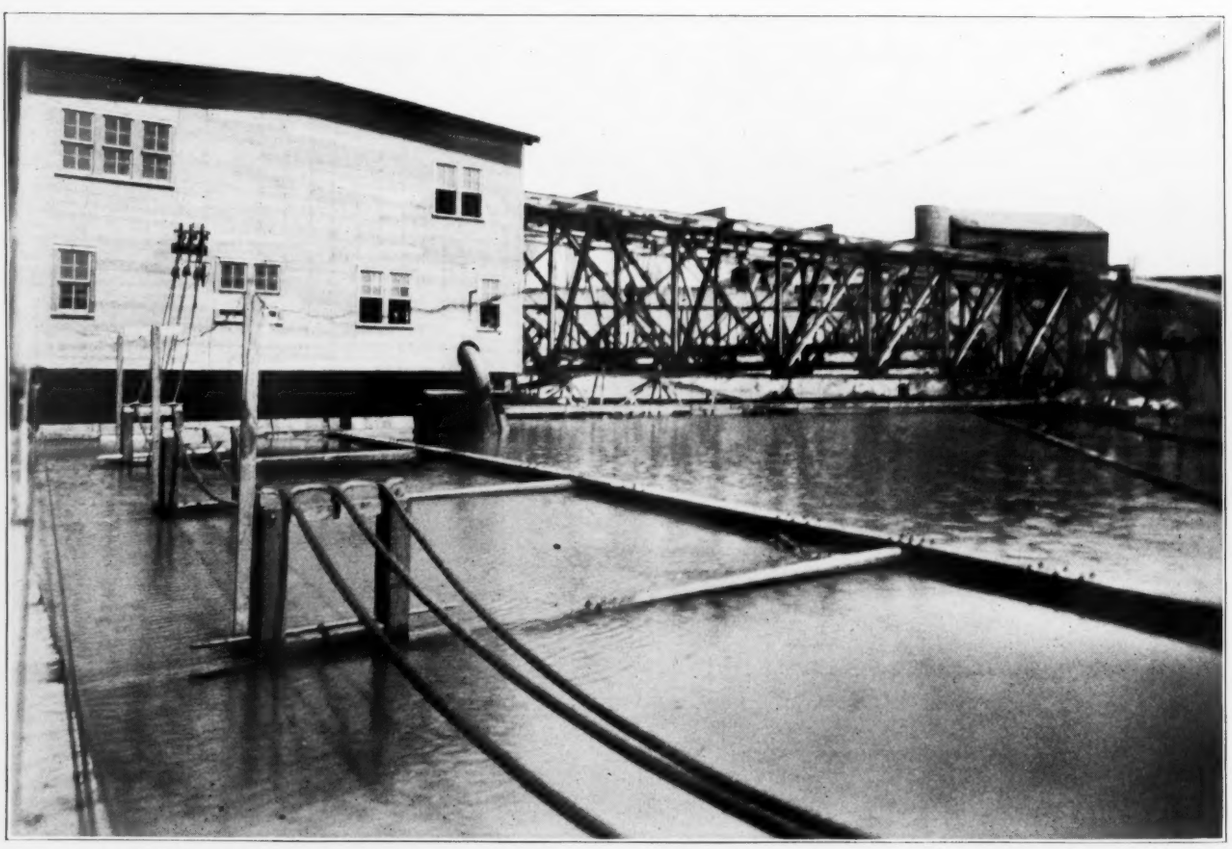


One of the Ward Excavation Units Elevated Out of Water. There Are Two of These Units. This Illustration Also Shows the Steel Truss Supporting the Two Suction Lines. The Dredge Is Straight Back

and many were loud in their denunciation of Ward's application of the principle. However the facts were available to anyone who wished to visit Oxford. Some did and admitted that results were being secured but still they insisted later developments would probably show the inefficiency of the system. The fact is that in 1925 F. L. Ward was not himself completely satisfied that he had fully developed his system but he was firmly convinced that his ideas were correct. Time saw the completion of many experiments and the perfection of the system. We reported progress annually and are greatly pleased in this issue to report that F. L. Ward has perfected his system with a tremendous production record behind it. The Ward Sand and Gravel Company has used the perfected Ward system this year as the only means of excavation in what is probably the largest single sand and gravel producing unit in the world. The capacity of this plant is more than 300 cars of sand and gravel per day.

The Ward process of excavation consists of two units mounted on a dredge. In each unit a 6 foot cylinder with a 14½ inch intake projects at an angle of 45 degrees from an 18 inch U shaped pipe line which has 115 feet on the under or suction pipe line. During the present visit the dredge was digging to a depth of 89 feet. However, material has been excavated at a depth of 110 feet on a 60 degree incline of the suction line. Each U shaped pipe is supplied with clear water by Allis Chalmers pumps mounted on the dredge. Three 14 by 14 pumps in series take care of one unit while two 14 by 12 supply the other. The three pumps are driven by three 400 h.p. slip ring Allis Chalmers motors while the two pumps are driven by two 550 synchronous Allis Chalmers motors. With a 92 per cent power factor three pumps are 80 per cent efficient. The clear water comes into the U shaped line on the upper side and after it passes around the U is carried through a Venturi 15 inches in diameter and carries with it the sand and gravel pulled up through the 6 foot extension by the air lift created. An ejector nozzle placed directly back of the entrance of the 6 foot cylinder to the suction pipe of the U provides additional water under high pressure which increases the velocity of flow and eliminates back pressure in the suction line. Air may be used here in place of water and, if so, any danger of separation between this air and the water in the line can be eliminated by using a spiral twist in the pipe line beyond the Venturi. A single 1¼ inch jet of water is carried down to the intake end of the 6-foot suction extension to loosen the material in the bed. The pipe is straight steel welded. The throat is of special manganese steel construction. This system of Ward's is operating with a total power cost on the dredging end varying between 3.1 and 3.6 cents per ton.

Mr. Ward has, by his original applications to this so called hydraulic elevator, eliminated all



View Showing Dredge with Steel Truss Extension for Supporting Suction Line

back pressure and arranged the Venturi in proportions to the suction intake, velocities, etc., so that he can excavate material containing up to 40 per cent solids and including pieces 14½ inches in diameter at less cost per ton without serious interruptions due to excessive abrasion. It is apparent that the system has remarkable tonnage possibilities. Both units can be operated together although Mr. Ward does this only when necessary. The system is laid out as a dual unit for dual service if necessary but the main object is to insure continuous operation as each unit is raised and lowered separately. The raising and lowering is handled by Thomas hoists. There are three Thomas hoists in use. In addition to handling the suction line they are used for moving the dredge. One is a three drum unit while the others are two drum.

The dredge itself is of Ward design. The dredge proper is 42 by 90 feet but with the steel truss support for the suction lines it is 90 by 192 feet. The illustrations show its unusual appearance. The two U shaped pipe lines are long and heavy and are carried by a steel bridge truss construction supported on one end by the steel frame dredge and on the other by pontoons. Steel wire rope is used in raising and lowering the suction lines and this rope and other wire rope in use is of American Steel and Wire, Leschen, and Roebling manufacture.

The excavated material is discharged through the pipe line directly to special self unloading barges designed by F. L. Ward. These barges consist of a steel hopper supported on steel pontoons 10 feet in diameter and 38 feet in length and each has a capacity of 600 tons. There are three of these barges and they are hauled an average distance to shore of 1200 feet by tugs. The barges are unloaded by a belt conveyor running below the hopper and above the pontoons through the long center of the barge. The material passes from the hopper to the belt conveyor through gates. This belt conveyor is a 36 inch wide Manhattan and discharges to a hopper on shore.

From the shore hopper the material is carried to the plant by a 36 inch 270 foot centers Manhattan belt conveyor and delivers to the main gravity screen. The oversize passes to a Cedar Rapids primary crusher and the throughs are carried to the washing and screening plant by a 400 foot 30 inch Manhattan belt conveyor. The various sizes are prepared by six secondary crushers, four of which are Cedar Rapids units and two are Acme units. All screens for sizing are flat screens. Both W. S. Tyler "Hummer" screens and Hendricks screens are used. The crushers are each belt driven from an Allis Chalmers electric motor. The primary crusher has a 75 h.p. unit while the secondary crushers each have 35 h.p. units. Falk 100 h.p. speed reducers are used on practically all belt drives.

Outside storage is used and a tunnel belt conveyor reclaims the material for loading to cars. A 600 ton bin is used for truck loading. Cars are spotted for loading by a Thomas two drum hoist. The Ward Sand and Gravel Company has two and a half miles of railroad siding at the plant and shipments are made over the Grand Trunk Railway System and the Michigan Central Rail-

View Showing Dredge Discharging into Hopper Barge

road. Single cars have been loaded in thirty seconds but for continuous loading the record is 31 cars loaded in 62 minutes.

The Ward Sand and Gravel Company includes F. L. Ward, president and general manager; J. J. Kennedy, vice president; M. D. Ward, secretary, and Mrs. E. M. Hammond, treasurer. L. J. Dyament is sales manager and J. C. Garrels is superintendent in charge of plant operation.

Those who know Mr. Ward are pleased with his success. His early efforts were made against many obstacles not the least of which was general skepticism. Courage was an important factor because a man of fifty must succeed in any new departure of significance. Failure was something Mr. Ward never even considered. He couldn't, under the circumstances. That he succeeded is an important fact to the sand and gravel industry as he has accomplished for an industry not especially noted for its engineering achievements what the engineers had considered impractical.

New Record Auto Production

Automobile production increased its record pace during June, an announcement of the U. S. Commerce Department reveals. Output for the month exceeded the best marks of previous years by an even greater margin than in May, also a record month, it is found.

June production of cars and trucks totaled 396,700 machines. This was 74,700 more than in June a year ago, and 16,300 more than in the former record year 1926. In May this year output was 21,800 machines larger than in 1927 and 8,700 larger than in 1926.

Announcement of the June production volume strengthens the widespread belief that this year's motor output will be the highest in the history of the industry. Output to July 1 now stands at 2,201,800 machines, or within 104,000 of the peak production of 1926 when 2,305,800 cars were turned out in six months. In the first half of 1927 approximately 2,068,900 machines were produced.

The June gains are shown to be wholly in the passenger car field. Output of this class of vehicle totaled 356,400 machines, compared with 278,700 in 1927. Truck production was 40,300, approximately 3,000 less than last year.

Freight Car Loadings

Loading of revenue freight for the week ended on July 28 totaled 1,033,976 cars, the car service division of the American Railway Association announced recently. This was an increase of 160 cars over the preceding week, increases being reported over the week before in the loading of grain and grain products, coal and forest products. Merchandise less than carload freight, miscellaneous freight, livestock, coke and ore showed reductions under the week before.

The total for the week of July 28 was a decrease of 10,721 cars compared with the same week in 1927 and 62,021 cars below the total for the corresponding week two years ago.

Grain and grain products loading amounted to 55,265 cars, a decrease of 3,536 cars below the same week last year and 7,474 cars below the same week in 1926.

Livestock loading amounted to 22,046 cars, a decrease of 4,388 below the same week last year and 4,988 cars below the same week in 1926.

All districts reported decreases in the total loading of all commodities compared with the same week last year except the central western and southwestern, which showed increases. All districts reported decreases compared with the same period two years ago, except the southwestern, which reported an increase.

	1928	1927	1926
Jan. 7	754,062	933,940	907,622
Jan. 14	906,734	942,731	931,735
Jan. 21	884,095	936,160	921,643
Jan. 28	902,832	943,879	925,696
Feb. 4	926,204	965,664	914,491
Feb. 11	906,009	962,602	917,625
Feb. 18	887,891	954,794	932,281
Feb. 25	869,590	918,858	912,935
Mar. 3	959,537	989,863	965,009
Mar. 10	951,553	1,000,754	967,425
Mar. 17	942,086	1,001,932	977,018
Mar. 24	950,428	1,003,526	967,945
Mar. 31	950,249	986,462	928,303
April 7	919,296	953,907	929,343
April 14	912,377	949,561	964,794
April 21	944,694	950,545	973,158
April 28	961,928	1,021,596	995,408
May 5	979,662	924,761	996,216
May 12	1,001,983	1,029,424	1,029,748
May 19	1,003,497	1,027,498	1,039,070
May 26	1,020,916	1,026,789	1,080,786
June 2	934,214	911,510	944,864
June 9	995,960	1,028,367	1,052,471
June 16	1,003,292	1,016,479	1,036,643
June 23	986,789	1,018,060	1,055,362
June 30	1,003,049	1,021,438	1,065,641
July 7	850,605	839,085	897,556
July 14	1,024,534	1,017,394	1,076,372
July 21	1,033,816	1,012,585	1,078,193
July 28	1,033,976	1,044,697	1,095,997

Peanut Shells to Be Used for Gypsum Concrete

Tests being conducted by the United States Bureau of Standards using peanut shells as a substitute for wood chips in gypsum fiber concrete used in the floors and roofs of buildings indicate that although the concrete made with shells is no stronger it will at least be cheaper. Wood has been used to make the concrete lighter, but because of the high price of wood chips, which must be of regulation size, a substitute is being sought. The shells are treated with a disinfectant to prevent decay before they are used.

SIMPLICITY AND EFFICIENCY COMBINED IN NEW OHIO DREDGING PLANT

NOVEL arrangements have effected economies in the new hydraulic sand and gravel plant of A. J. Clementz's Sons Company at Massillon, Ohio. Simplicity has been combined with efficiency to produce a unique and thoroughly economical unit. Bartlett Snow Company built the plant. The complete plant consists of a Morris dredging unit equipped with a heavy duty Eagle Swintek suction screen nozzle, 600 feet of 10 inch pipe line, concrete sump, skip buckets, washing, screening, crushing and storage units.

Figure number 1 shows a general layout of the scow and the pumping equipment, also of the sump into which the material is pumped, the skip hoist, washing and screening equipment, as well as the crusher for reclaiming the oversize product.

The dredge is built on six standard car tanks 6 feet in diameter and 26 feet in length. One of the advantages of using equipment of this kind is that the scow can be easily leveled up after the equipment has been installed on same. Should one end of the dredge be too high, water can be easily let into one or two tanks as may be required to make the scow ride level.

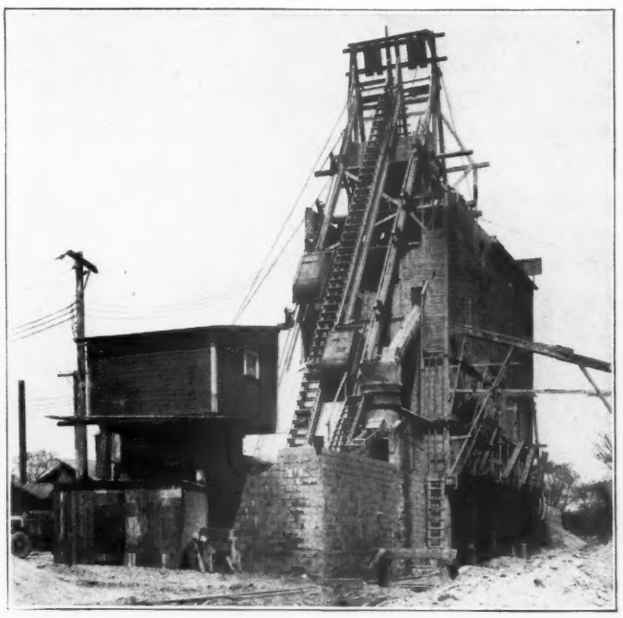


Figure Two

The dredge is equipped with one Morris 10-inch heavy duty dredge pump mounted on a cast iron sub-base and directly connected to a 300 h.p. West-

Figure One

ern Electric 600 r.p.m., 3 phase, 60 cycle, 220 volt, slip ring variable speed induction motor. This pump has a capacity of 90 cubic yards per hour when operating in 35 feet of water, with a pipe line not over 600 feet long, 10 inches in diameter, and with a static lift on the discharge end of 25 feet.

The suction pipe to this pump is provided with a heavy duty Eagle Swintek suction screen nozzle ladder and agitator 40 feet long. The chain of the agitator is of heavy Amsco manganese steel construction. This agitator is driven from a 25 h.p., 900 r.p.m. General Electric motor. The agitator is provided with a four drum hoist geared to a 15 h.p. motor so arranged that all the levers may be operated at one point. This hoist serves for raising and lowering the suction, swinging the dredge to either side and for holding the dredge into the bank.

There is mounted on this dredge a service pump with 5 inch double suction to provide circulating water for the water seals, priming the 10 inch dredge pump, also water at a suitable pressure for the hydraulic giant used for breaking down the gravel bank which stands 65 feet above the water level.

Figure number 2 shows a general outline of the sump into which the pump delivers the material from the dredge, the sump in this instance being built of concrete block and is shown in the foreground. This sump is arranged with two compartments. Over one compartment is a perforated plate with proper perforations for taking out the sand and as the material flows from the pipe it flows over this plate, the sand being deposited in the sump underneath the plate, all the coarse material going over into the other compartment. As the material settles into these sumps the water flows over the top into a flume and is carried away from the plant.

Figure number 3 shows the general layout, including the washing and screening plant and storage arranged to load either into trucks or railroad cars as may be required. By referring to this illustration it will be noted that at the bottom below the sump or sand and gravel pits is shown the 60 cubic foot skip bucket. The operator stands on the grade level just back and underneath the skip runways so that he can at all times see the top of the bucket which is being filled. The slide gate at the bottom of the sump is operated by means of an air cylinder and as the operator moves the lever which controls the slide gate it allows the material to flow into the bucket.

When the bucket is full the operator closes the gate, then pushes the button which controls the hoisting engine or starting switch. The current

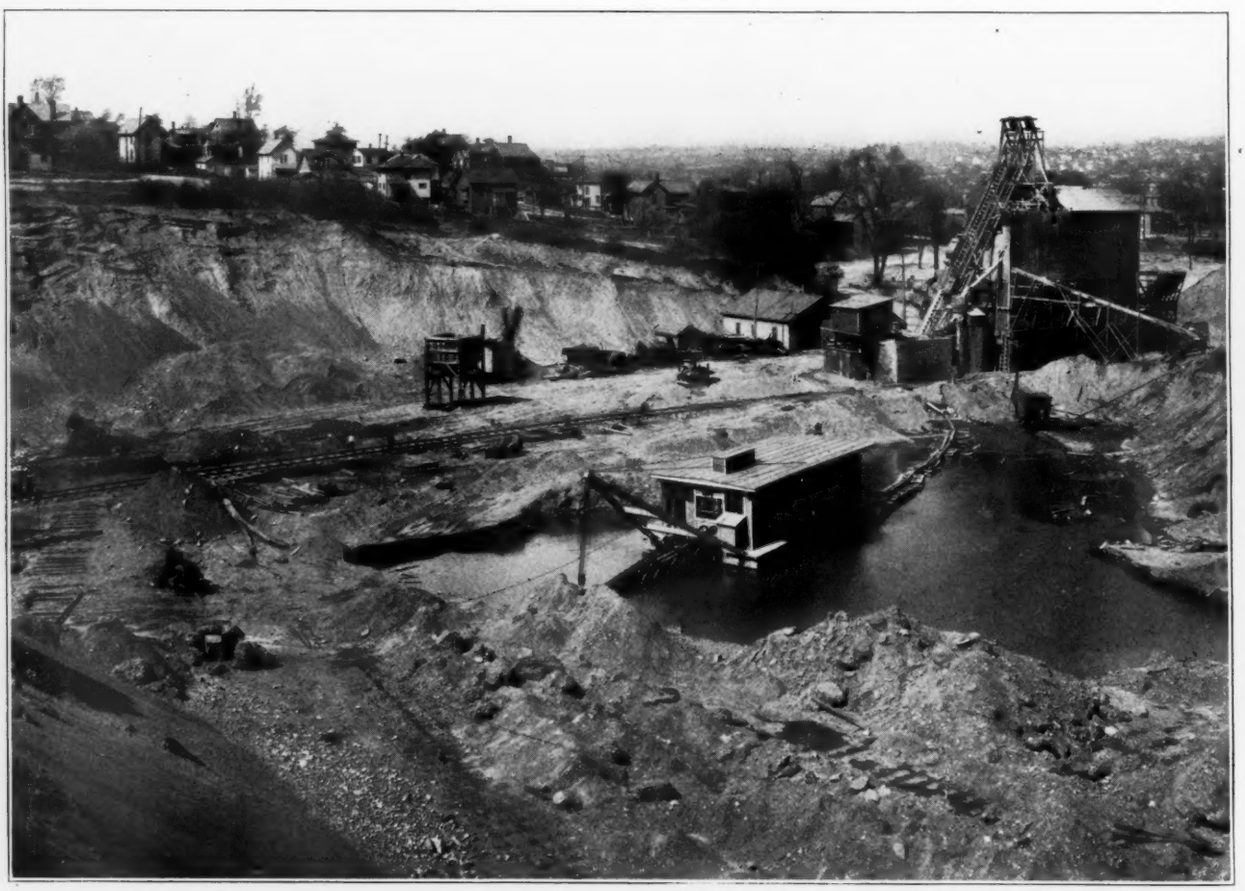


Figure Three

then passes to the hoisting engine motor and the bucket starts its upward travel.

The electrical control equipment accelerates the bucket to full speed until it reaches nearly the point of discharge where it slows down and holds the bucket in the dumping for a clean discharge, the bucket remaining in this position until the other bucket is loaded at the bottom of the pit, when the same cycle is repeated. The bucket cannot start until the operator pushes the button.

The skip bucket delivers the sand at the top into a bin where water is added and it then overflows into a settling chamber where the sand settles and overflows into the flume which carries the water away. The sand is discharged from the settling chamber into the two sand bins shown in the cut.

The gravel bucket delivers the material also into a bin from which it is discharged into a scalping screen. This screen is used for both washing and scalping off the product that is too coarse to be used. This coarse product is returned by gravity through a spout to the crusher where it is crushed, the product returning to the gravel sump directly over the outlet gate immediately returning to the skip bucket and going up the second time. It then flows through the balance of the material to the scrubber in the washing and screening unit.

The scrubber and screening unit in the plant is 48 inches in diameter and 25 feet long. This scrubber has two compartments, each of which is provided with lifting angles for thoroughly agitating and scrubbing the material and as more clear water is cascaded into the product all particles of the clay or loam are freed and carried with the product into the receiving end of the screen.

This section is clothed with ¼ inch steel plates with ½ inch perforations. All of the material under ½ inch in size readily passes through this plate and all the water and is delivered into the sand screen through which the sand and water pass, entering a flume to the settling tank where the sand settles and the water carrying the substance washed from the material flows over said tank into a flume as waste. The material passing over the sand screen being sized from ¼ to ½ inch is usually termed pea gravel.

The next section of screen has 1 inch perforations and the last section 1½ inch perforations. Any product tailing over this latter section will not be over 2 inch in size as this is the size perforation on the scalping screen through which the material enters on leaving the skip bucket. All oversize is taken out on this screen and passed to the crusher and recrushed.

The washing and screening unit can be arranged

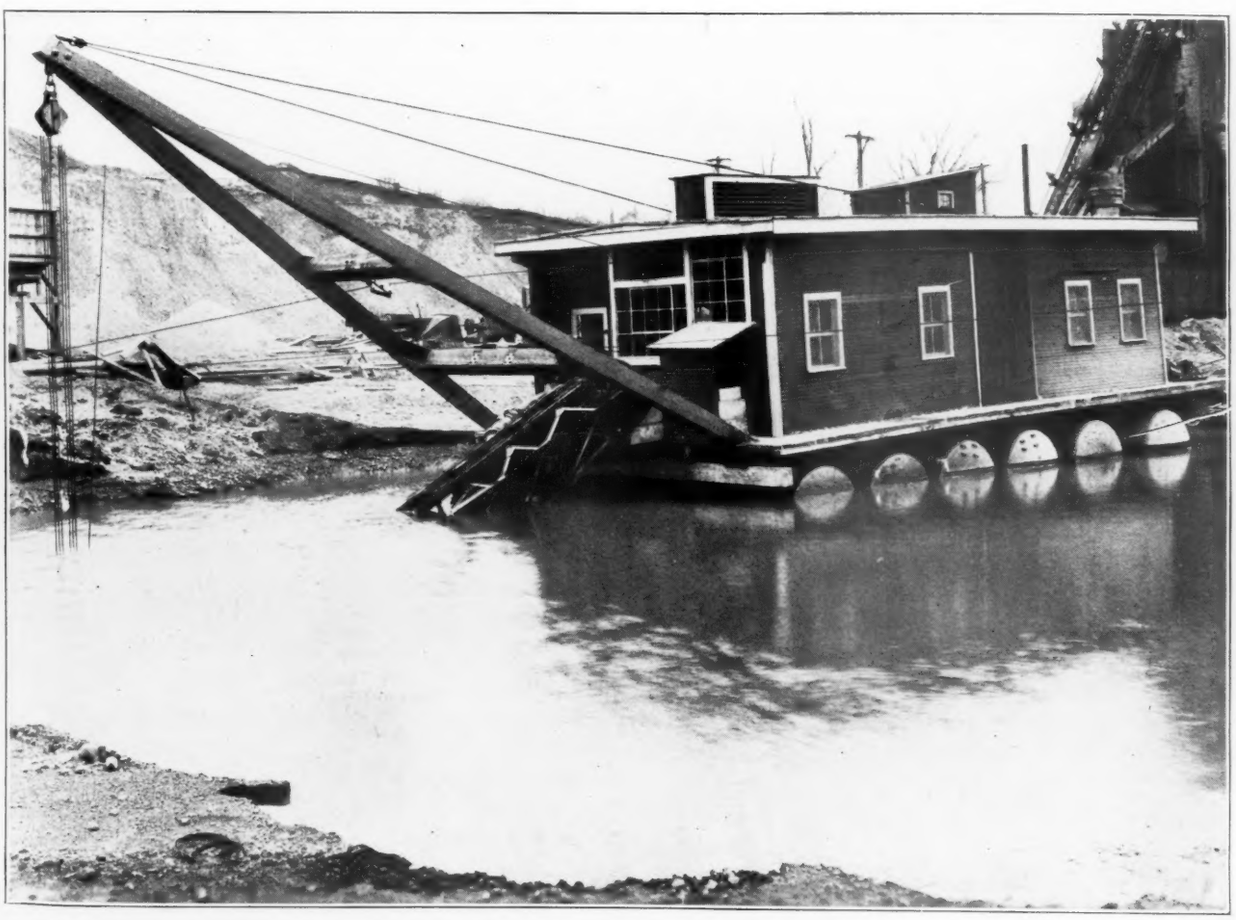


Figure Four—Close-up of Dredge

for additional scrubbing and washing of material at any given section in the cylinder which may be required.

The hoisting engine is of the spur gear driven type with solid cast iron sub-base and fully enclosed gears, being entirely self-contained. The shafts are made entirely of hammered steel. The main shaft on which the drum is mounted is carried in bronze bushed bearings, the drum being 30 inches in diameter and scored for 7/8 inch cable.

All of the gears enclosed in this engine housing are made of open hearth cast steel with teeth cut from solid blanks. The pinions are of forged steel cut from solid blanks, and run in oil.

The bearings for the intermediate and motor extension shafts are mounted in Timken roller bearings which are dust tight, all the exposed ends being closed. The motor is mounted on the same base as the engine and is connected to it by means of a flexible coupling. A 14 inch Cutler-Hammer shoe type brake is mounted on this shaft. This equipment is provided with a limit switch which controls the travel of the buckets. Cutler-Hammer electrical control equipment is used for controlling the operation of the skip bucket.

Simplified Practice Increases

Ray M. Hudson, Assistant Director in charge of the Commercial Standards Group of the Bureau of Standards, United States Department of Commerce, of which the Division of Simplified Practice is a part, has rendered a report covering the activities for the quarter ending June 30, 1928. During the quarter nine simplified practice recommendations came before the respective standing committees for review, making a total of 95 to date.

The American Marine Standards Committee was organized primarily to promote simplification of practice and economy in the construction, operation, and maintenance of ships and port facilities. Authority is vested in a membership enrolled from the marine and allied industries. An Executive Board, elected annually from and by the membership, appoints and controls the administrative officers and technical committees, directs the general policies, and defines the technical working program. The Board also created a Standing Committee on "International Standardization of Shipbuilding Details" to which all proposals for international marine standards are to be referred.

According to Mr. Hudson, manufacturers are gradually recognizing the fact that a fertile source of profits lies in the elimination of excessive variety in goods offered to the public. Lines, items, sizes, types, styles, models, and even brands, for which there is little demand are being dropped in favor of those that enjoy a better turnover. Tangible benefits, such as smaller inventory investments, better turnover, lower costs, better service, and better profits, are resulting from this concentration and simplification.

Wholesale and retail distributors are finding they can apply simplification to their own stocks and enjoy the same benefits as the manufacturers. The increasing number of inquiries regarding inventory control, simplification, and other related subjects coming into the Department shows that an increasing number of them are testing, or considering doing so, these applications in their establishments. These inquiries cover all kinds of retail businesses.

That interest among consumer groups is also developing at a fairly rapid rate is shown by the increasing number of inquiries from them received by the Department. Industrial purchasing agents and store department supervisors have quickly realized the opportunities offered by simplification to more effectively control their expenditures. Large corporations and railroads have already made substantial savings through simplification and its application is now spreading among the smaller firms. Individual consumers are becoming better acquainted with the wastes of over-diversification and a reaction against it is already developing in some quarters.

Over-diversification and manufacturers' efforts to stimulate sales by forced obsolescence or rapid style changes are forcing merchants to clear stocks more rapidly than is warranted by the normal consumption of the buying public. In consequence, prices are being cut, and the expected profits from the larger sales are being absorbed by the cost of the extraordinary merchandising efforts necessary for such a rapid turnover.

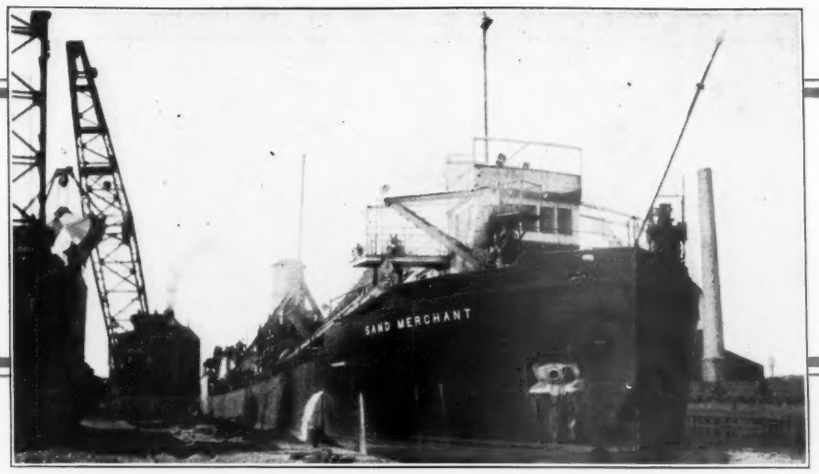
Compare Autos and People

The ratio of automobiles to population in the United States ranges from a high of 1 car to 3 persons in some states to a low of 1 car to 12 persons in others, according to the National Automobile Chamber of Commerce. The average for the entire country is between 5 and 6 persons for each machine.

The people of Kansas and California are the most plentifully supplied with automobiles, it is shown. Machines in these states are sufficient to furnish one to every third inhabitant. Iowa, Nevada, Oregon, Nebraska, Florida, Colorado, North Dakota and Michigan each have 1 car to every 4 residents.

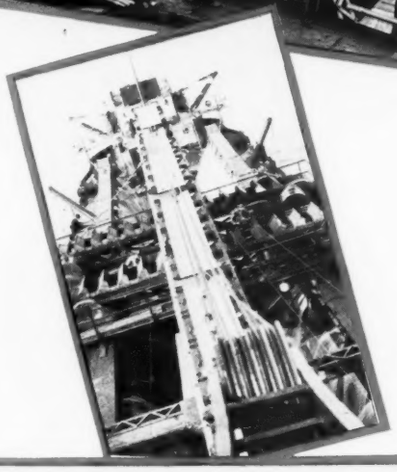
Alabama and Georgia rank at the other end of the scale. In these neighboring states the number of automobiles to people is such that if evenly apportioned each machine would have to do duty for 12 persons. In Arkansas the ratio is 1 car to 11 persons; in Tennessee and Kentucky it is 1 to 10.

The S. S. Sand Merchant



(2200 CUBIC YARDS CAPACITY)

Demonstrates the Efficiency of Webster Engineering and Equipment . . . .



LARGER capacity—greater unloading speed—better balance—typify Webster Engineering Standards.

That is why the Inter Lake Transportation Company turned to Webster for the S. S. Sand Merchant.

Whether you retain Webster to design, build and equip new units, or to rebuild and convert old freighters, Webster Engineers study your individual problem.

Complete line of equipment for processing and handling all bulk materials.

THE WEBSTER MFG. COMPANY
1856 North Kostner Avenue
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BUFFALO
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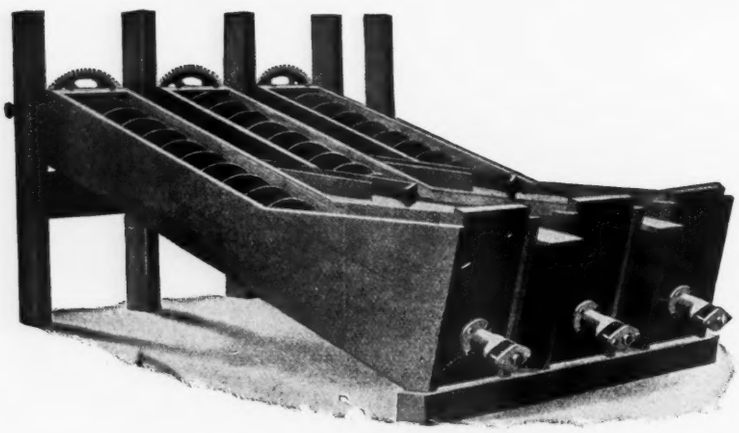
WEBSTER

60 Lewistown Sand Washers Installed by Mifflin Sand Co.



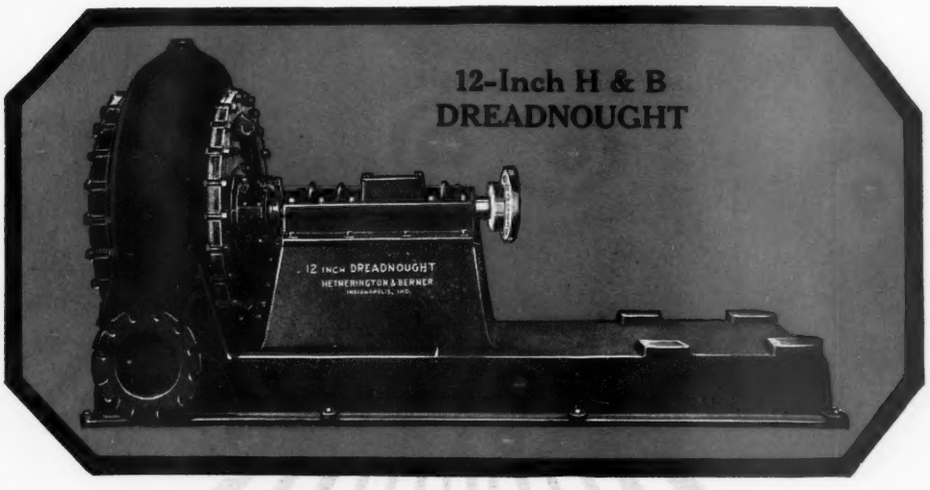
THEY come back for more! Once Lewistown Washers are installed the additions are Lewistowns, too.

Take for instance the Mifflin Sand Company, Lewistown, Pa. Their two plants are both equipped with Lewistown Washers. Eight additional washers with a total capacity of 150 tons per hour were recently installed in their new plant—of course they were Lewistowns. The total Lewistown units now being used by this company is 60.

Not only does performance say—Buy Lewistowns—but their low price says it just as emphatically. Worth your investigation. Write today.

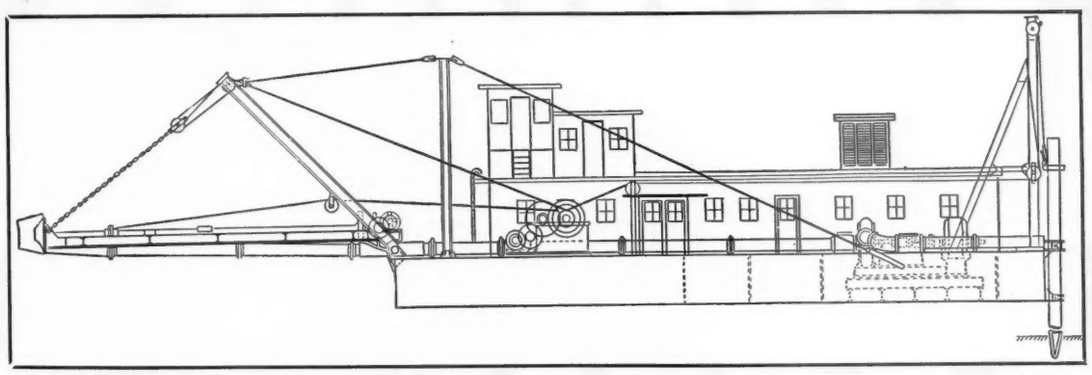
Lewistown Fdy. & Machine Co.

Lewistown, Penn.



The 12-inch Pump shown is characteristic of the H. & B. Dreadnought line. This Pump is equipped with manganese shell, impeller and disc liners, and has also the special H. & B. Bearing.

The H. & B. Dreadnought insures successful, profitable operation and also low maintenance cost. The Dreadnought line is built in sizes from 6″ to 15″.



H. & B. Service

Includes the design and construction of complete suction dredges and all component parts such as Ladder Cutters, Hoists, Pontoons, etc. Illustration shows plan of a dredge now under construction in our plant.

Let us figure on your requirements

Hetherington & Berner

INDIANAPOLIS — Established 1867 — INDIANA

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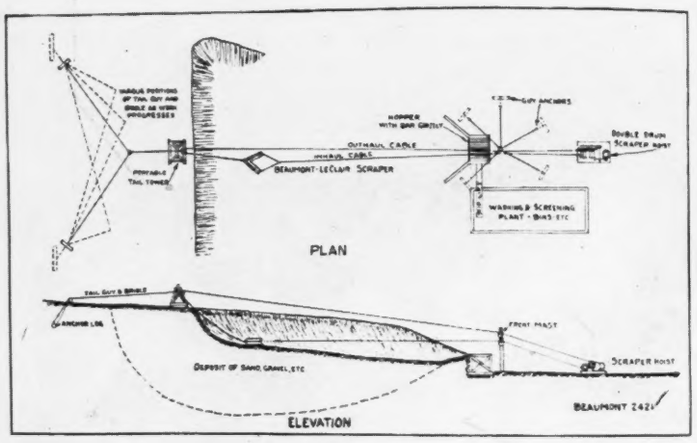
Cable Drag Scrapers

Cat. 95

2 R. H. BEAUMONT COMPANY, PHILADELPHIA



Beaumont Cable Drag Scraper System

Features

1. High Capacity.
2. Low First Cost.
3. Low Maintenance Cost.
4. Low Operating Cost.
5. Simplest System in Use.
6. One Man Operation.
7. Few and Rugged Parts.
8. Handles Fine or Lump Material.
9. High Salvage Value, on Account of Mobility.

THE Beaumont Cable Drag Scraper System is advocated by us as the best solution of the ground storage problem and for stripping overburden, working bank deposits of sand, gravel, clay, etc.

The system is not new. Placed on the market by us many years ago it achieved im mediate and sweeping success.

Machinery is reduced to its simplest form, consisting of a few rugged parts—scra double drum scraper winding machine, set of cables, sheaves and fittings.

Due to the few and rugged parts, not only is maintenance expense reduced to minimum, but installation costs are surprisingly low.

R. H. BEAUM

D

A CABLE to which the s the scraper winding ma flexibility of operation.

One cable—the load cab winding machine to the fr cable—runs from the rear dr and thence over the necessar

By throwing a lever the the load cable in operation, a and the cutting edge digs, th

When the scraper is loa charge point.

By releasing the front dr the return cable is put in op

The scraper is dragged b any desired place on the hau

Scraper Handling San

If you are interested in cutting costs, write for catalog No. 95

Page 2 of this catalog is reproduced above

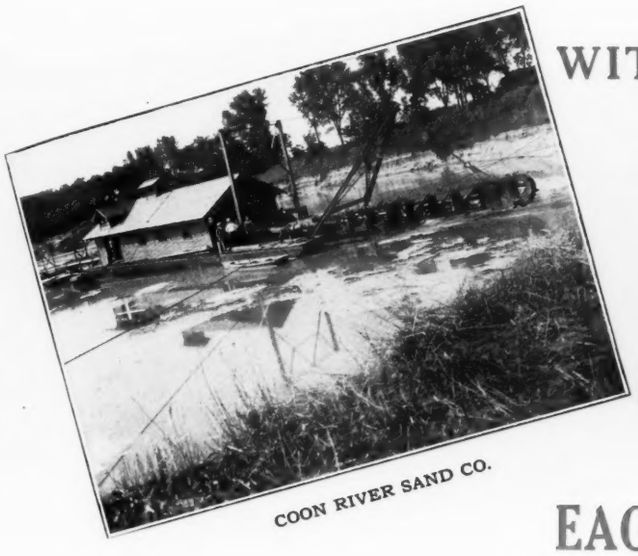
A system that can be adapted to the requirements of the small plant handling 100 cubic yards of sand or gravel per day or to the plant handling 2000 cubic yards.

R·H· BEAUMONT CO.

320 Arch St., Philadelphia, Pa

2025—A Straus Building, Chicago, Ill.

NEW PLANTS, NEW METHODS, NEW EFFICIENCIES



COON RIVER SAND CO.

WITH

VAN METER, IOWA

EAGLE "SWINTEK" SCREEN NOZZLE LADDERS

NEW PLANTS

The Coon River Sand Co., in planning their new Van Meter plant selected their equipment to co-ordinate for maximum plant efficiency. Without any hesitancy they installed the EAGLE "SWINTEK" SCREEN NOZZLE because its agitation of the deposit and cutting action would guarantee an even, steady flow of solids.

NEW METHODS

A. J. Clementz's Sons of Massillon, Ohio, recently changed from dry land operation to a pumping plant for gathering their sand and gravel. To insure themselves a uniform flow of material with no "line clog" operating delays due to boulders or debris, their natural selection was the EAGLE "SWINTEK" LADDER. The methods of both this plant and the new Coon River Sand Co. plant are interestingly described in the editorial section of this magazine.

NEW EFFICIENCIES

The Macksville Gravel Co., of Terre Haute, Ind., are digging 18 feet deeper with an EAGLE "SWINTEK" and are pumping three times the former amount of material; The Commerce (Iowa) Sand and Gravel Co., pump a 60-ton car in 15 minutes where before EAGLE "SWINTEK" installation it took an hour; The Baker Sand and Gravel Co., of Noblesville, Ind., advise a 400 per cent efficiency increase based on capacity and they "would not operate a day" without their "SWINTEK" Nozzle.

Let us tell you more about the EAGLE "SWINTEK" SCREEN NOZZLE LADDER. Let us show you how it will increase your capacity and cut your power costs by increased pumping efficiency. Thus the LADDER will soon pay for itself and then continue to pay you dividends far beyond its initial cost.

Send for our descriptive bulletin

EAGLE IRON WORKS DES MOINES, IOWA

NACO
handles it faster, easier and *cheaper*.

NACO Cast Steel Shovel Chain will show a material saving in cost, per ton, of digging and handling mine or rock products.

NACO Shovel Chain is made of Naco Steel, having an elastic limit of about three times that of ordinary steel. This practically eliminates the troubles due to chain stretch so common in forged chain.

NACO links are absolutely uniform in size and shape, and are cast in one solid piece *free from welds*. This produces a stronger, smoother running chain, which results in easier handling and speeding up shovel operations.

Write for further information.

We also manufacture Naco Steel mine car Wheels and Hitchings.

NATIONAL MALLEABLE AND STEEL CASTINGS CO.
General Office — Cleveland, O.

NACO TRADE MARK CAST STEEL CHAIN
The Strongest Chain Made

YEARS of use have definitely established the merits of Taylor Spiral Riveted Pipe. Its light weight, greater strength and low cost have made it the first choice of hydraulic engineers all over the world. Extreme rigidity, ease of transportation and installation, unbreakable forged steel flanges and unusual durability are some of its profit making features.

Made of special steel for long life, it may be supplied heavily galvanized or with a hot dipped asphalt coating inside and out. It is available in all diameters from 3 to 42 inches and in lengths up to 40 feet. Every length is hydraulically tested to fifty percent more than specified working pressure and its spiral construction makes it fifty percent stronger than any other riveted pipe.

A large catalog containing much valuable data and many interesting installation pictures will be mailed to you on request.

American Spiral Pipe Works

Main Office add Works: Chicago, Illinois, P. O. Box 485
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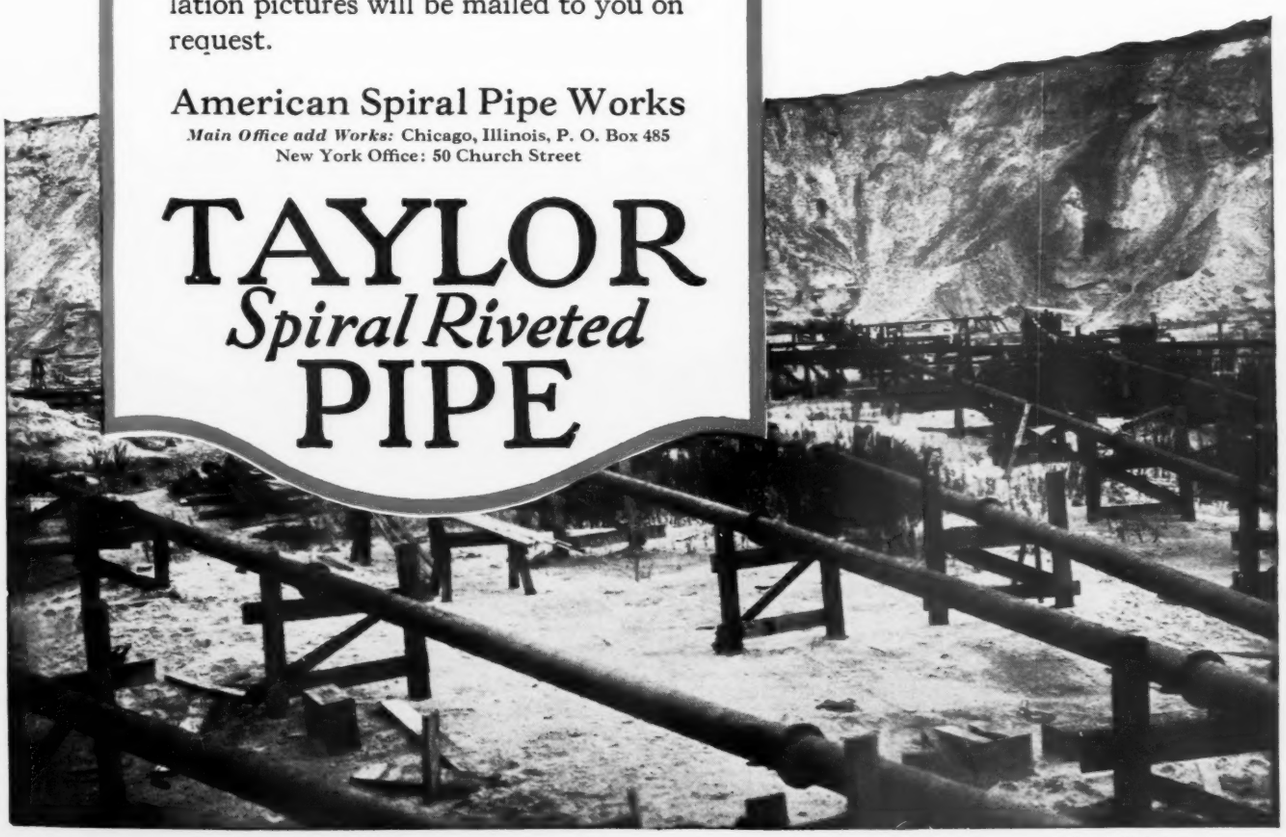
Spiral Riveted
PIPE

Proven
Pipe



P&Q 8-15-Gray

The Cheapest and Quickest Way to Remove Overburden

UNIVERSAL STRIPPING NOZZLE

UNIVERSAL STRIPPING NOZZLES
Universal Stripping Nozzles are made of cast bronze throughout except the discharge pipe, which is of seamless tubing, and the operating lever, which is of cold rolled steel. It is ball bearing, has no ground joints, no bolts or other obstructions in its waterways, does not leak under pressure, does not have to be staked down or anchored in any way.
UNIVERSAL NOZZLE CO.

A Copy of Hydraulic Stripping, a 16 page Booklet will be sent upon request

HYDRAULIC stripping of overburden, admittedly the best method, is made even more desirable by the use of the Universal Stripping Nozzles.

The Universal Stripping Nozzle overcomes the one possible objection to Hydraulic Stripping—clumsy and difficult of movement the old type equipment naturally had its disadvantages. But Universal has changed all this—The Universal is extremely flexible, easily moved and can be operated by one man.

It is the one Best way to strip overburden from stone, sand, gravel, or other mineral deposits as well as washing down sand or gravel banks, making cuts or fills.

UNIVERSAL
NOZZLE COMPANY
INDIANAPOLIS, INDIANA

Sand and Gravel Dredge Operated by Rhodes, Jamieson Company, at Pleasanton, California

Due to our long experience in manufacturing and operating dredging equipment in all formations, in many parts of the world, we are able to offer a most efficient service to sand and gravel operating companies. We are prepared to supply a complete new dredging outfit, or any parts which may be necessary to make your present dredge operate to advantage.

The dredge shown above, as originally constructed, was not operating satisfactorily. Yuba engineers studied the situation, recommended the introduction of principles found to operate to advantage in placer mining; supplied new parts, resulting in highly satisfactory operation.

Doubtless from time to time you have problems which Yuba engineers could solve to your advantage. Feel free to write us about your difficulties.

YUBA MANUFACTURING COMPANY

351 CALIFORNIA STREET **SAN FRANCISCO, CALIFORNIA**

Cable Yubaman

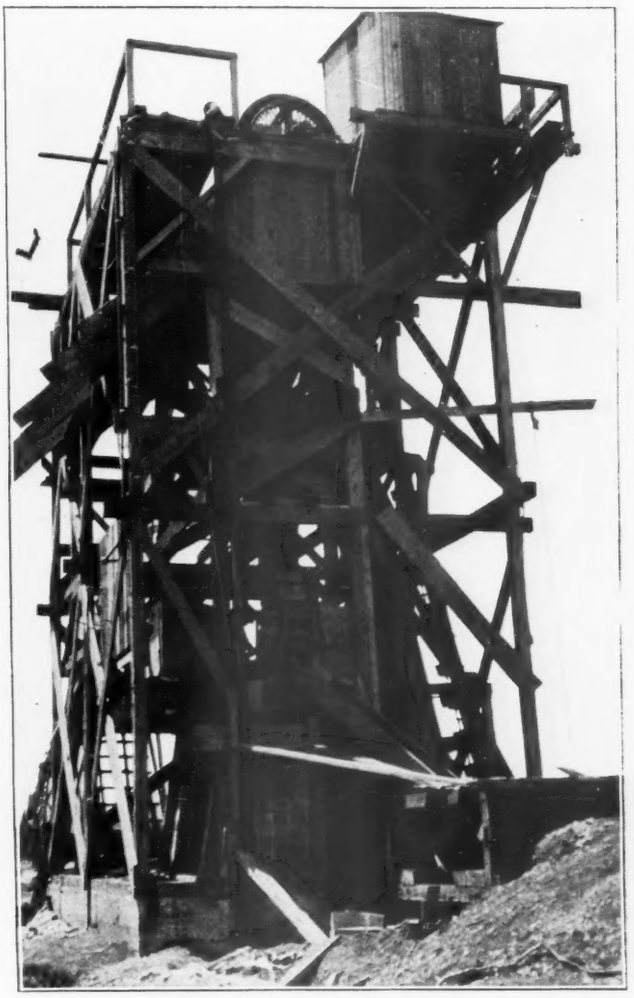
W. M. SEGUINE APPLIES HYDRAULIC METHODS TO FIVE PLANTS IN NEW JERSEY

By George Ransom

KENVIL, New Jersey, has a very high grade sedimentary deposit of sand and gravel which, when suitably washed and screened, meets the New Jersey state road specifications for these products. The sand is especially good. The largest operator in this district is Mr. W. M. Seguine who manages the Seguine-Bogart Company which has three plants and the Seguine Jersey Company which has two plants. These plants are all located in the valley of the Black River and the water level in the ground naturally stands so high (about 2 feet below the surface) that even at a considerable distance away from the river excavation is carried on by the hydraulic pumping method. Neither the waste ponds nor dredging ponds have either inlets or outlets. Drainage is purely a matter of seepage.

The combined capacity of the five plants is 3000 tons per day which is shipped mostly by rail over the lines of the Central R. R. of New Jersey and the Lackawanna R. R., both of which pass through this valley. Five grades of sand are produced, namely, brick, plastering, asphalt, engine and New Jersey and Pennsylvania specification highway sand. Only 10 per cent of the output is gravel and there are no cobbles so that no crushing machinery will be found except at one point as will be explained later.

The most thoroughly modern and up-to-date of the five plants under Mr. Seguine's supervision is known as Plant Number 3 and it will be interesting to observe the details of the machinery and



Central Gravel Plant, Showing Dumping Hopper, Elevator and Crusher

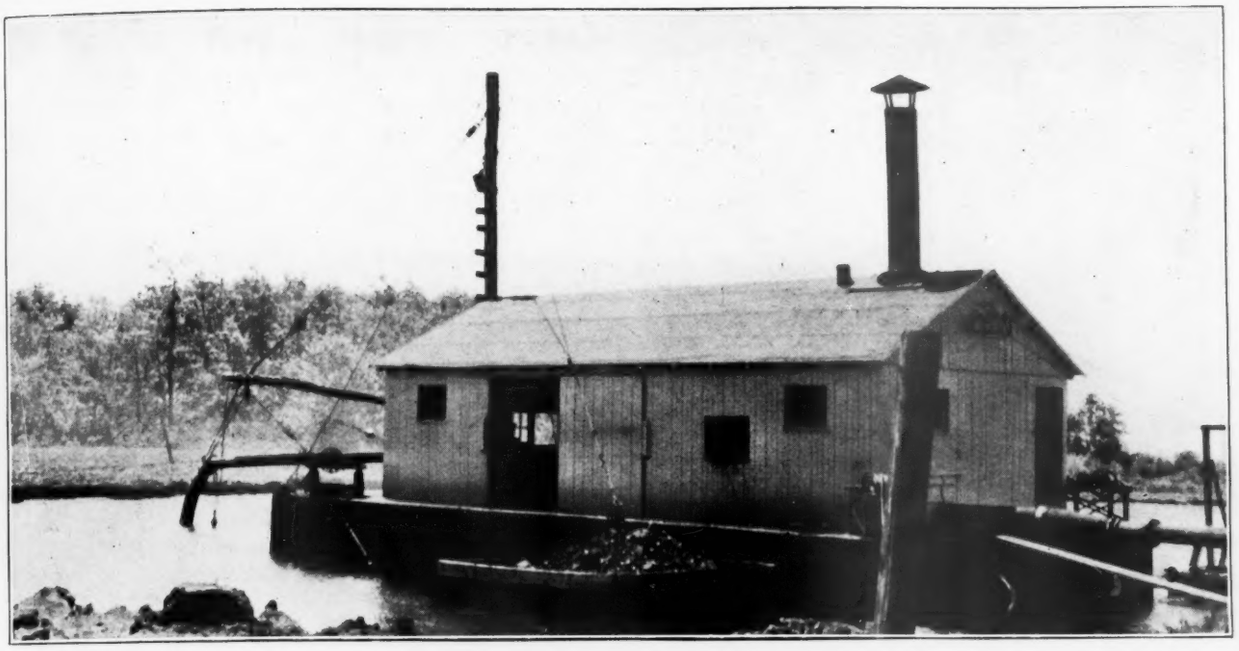
Plant Number 5. Hydraulic Dredge in Foreground and Float With Stripping Jet Equipment in Background

Plant Number 3. Settling Tanks for Asphalt Sand and Belt Conveyor to Stockpile

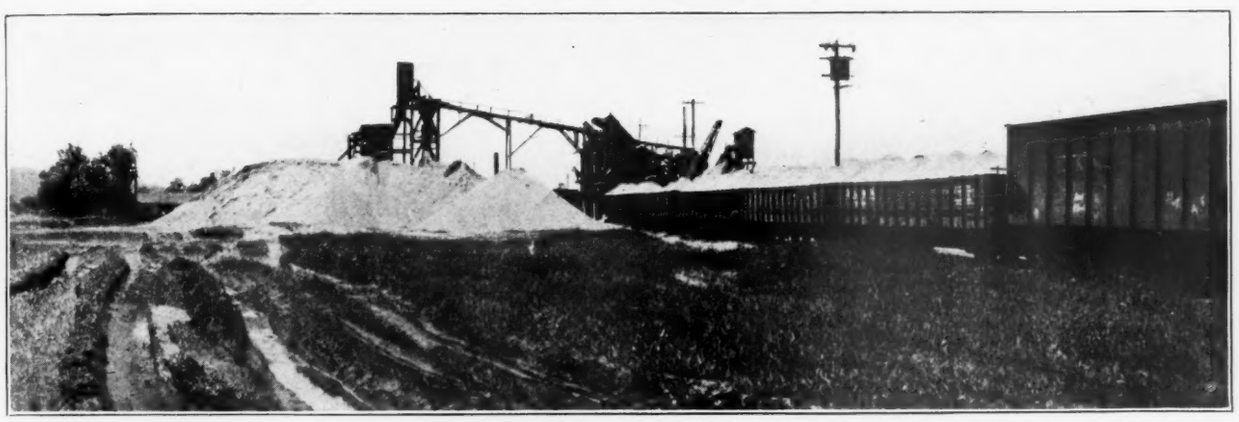
methods used here. Material is obtained from the beds by an 8 inch Morris centrifugal pump provided with a Morris thrust ball bearing and direct connected to a 125 h.p. Western Electric induction motor. Cutting is not required. The suction line is supported by a boom and it is raised and lowered by means of a Dake steam hoisting engine. Steam is supplied by an International boiler. All of this equipment is housed on a float 23 by 40 feet. Near the end of the boom where the suction line bends down into the water it is equipped with a 6 foot length of Goodyear rubber sleeve to give proper flexibility. A similar sleeve is placed in the discharge line on the float because of the tendency of the latter to swing slightly.

The mixture of sand and gravel is discharged on a stationary screen at the top of the plant for which New Jersey Wire Company wire cloth is used. The gravel slips off into a Good Roads revolving screen which sizes it. Pea gravel drops into a bin under the screen and the larger sizes are discharged from the end as tailings and fall

Plant Number 3. Discharge Line from Float to Stationary Screen. Revolving Screen at Right and Settling Tank at Left

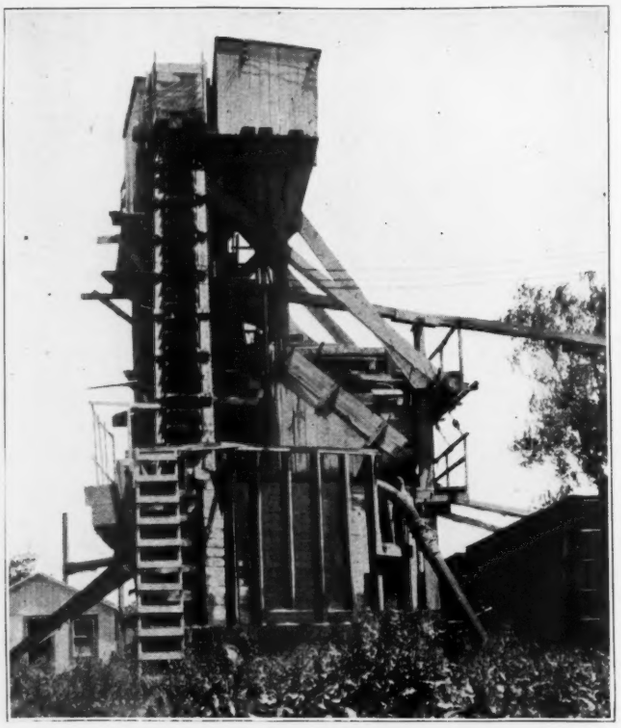


Plant Number 3. Showing Float and Boom Supporting Discharge Line



Loaded Freight Cars, Plant Number 3 in Background

Plant Number 3. Crane Used for Loading Cars and Trucks from Stockpiles



Plant Number 5. Discharge Line to Box, Elevator and Troughs

to the ground. The sand which passes through the stationary screen flows into an Allen Cone settling tank and the material obtained here is known as Specification Sand because it meets the specifications of the State Highway Departments of New Jersey and Pennsylvania. This is finally run off into large stock piles in anticipation of projected road work.

The overflow from this settling tank goes to a series of four more Allen Cone settling tanks arranged in series, the first two of which give brick and cast stone sand and the next two of which give asphalt sand. The overflow from the last two sets of tanks is waste. A belt conveyor, obtained from the Allen Cone Company, has been installed so that the last two settling tanks may be emptied on to it as they fill. The sand is then carried up to an elevation of 18 feet where it is discharged into stock piles.

Of course the stock piles are arranged so as to be as convenient as possible to the freight car siding and an Orton ¾ yard gasoline crane is provided to load both cars and trucks. There is also a Flory steam hoisting engine with International boiler to move freight cars.

Plants Numbers 1, 2, 4 and 5 are substantially alike but differ in several respects from Plant Number 3. A description of Number 5 will cover all of them. Any important variation will be noted.

The pumping equipment is the same as that already described for Plant Number 3. At Plant Number 5, however, it has been necessary to strip hydraulically because the ground here is wooded and the easiest way to get rid of roots and stumps seems to be to wash the earth out from around them. This has not been necessary at any of the other plants. The stripping equipment consists of a 4 inch Morris pump driven by a 20 h.p. Continental motor, installed and housed on a small float provided with a suitable jet.

The dredge discharges into a box on the bottom of the plant whence the mixture of sand, gravel and water is raised to the top by an elevator having 8x10x14 inch buckets of manganese steel made by the Taylor Wharton Company. The elevator discharges into a Galland-Henning vibrating screen which separates out the gravel and permits the sand to flow into a series of Allen Cone settling tanks which separate the various grades of sand. The Cones discharged directly into freight cars.

All of these plants have hoisting engines for moving freight cars, as follows:

Plant Number 1 Flory steam hoist
Plant Number 2 Lambert steam hoist
Plant Number 4 Flory steam hoist
Plant Number 5 Flory electric hoist

In addition to these dredging plants there is a central gravel plant which has just been completed. It is situated very close to Plants 2 and 4 but some distance from Numbers 3 and 5. The gravel is trucked to this point from all of them and

General View Showing Several Plants and Ponds Made By Dredging Operations

dumped into a hopper with opening at the ground level. It is fed through a Good Roads apron feeder to a bucket elevator which discharges into a 48 inch by 16 foot revolving screen. Both the screen and the elevator are Good Roads. The tailings from the screen drop into a Number 3 Champion jaw crusher and then pass by gravity to the elevator.

All of this material will be washed on account of the crushing operation and for this purpose a small centrifugal pump with a 10 h.p. Fairbanks-Morse motor has been installed in a small house to provide water.

There are no bins at this point. The gravel is to be either run directly into trucks or freight cars or to stock piles. Usually the gravel is taken as fast as it is produced for the percentage of it is small and the demand active most of the time. An Orton crane is used to load from the stock piles when this is necessary.

In addition to the equipment here outlined a centrally located machine shop is being constructed to care for repair work and odd jobs. There is also a garage. At present the Company has one 4 yard International truck and two Ford trucks. The fact that this deposit is located in central New Jersey near the lines of the Jersey Central R. R. and the Lackawanna R. R., both of which extend into Pennsylvania, is most fortunate. It means a widespread market and plenty of business.

Income from Income Taxes

The American people paid an income tax bill of approximately $2,174,496,000 in the past twelve months. This is the total of collections reported by the U. S. Treasury Department for the Government's fiscal year which closed June 30, 1928.

Three states paid nearly one-half of the entire income tax of the country, it is found. Collections in New York amounted to $646,523,000, or about 30 per cent of the whole. Pennsylvania with $216,936,000, and Illinois, with $201,151,000, contributed approximately 10 per cent each.

Michigan was the fourth state, paying $128,484,000. California paid $114,189,000 and ranked fifth. Ohio, with $113,778,000, was sixth. Next in rank were: Massachusetts, $98,537,000, seventh; New Jersey, $82,952,000, eighth; Missouri, $51,957,000, ninth, and Texas, $45,910,000, tenth.

The Government's revenue from income tax sources is shown to be $45,456,000 less for 1928 than for 1927, when $2,219,952,000 was collected. In 31 states payments declined during the year; in 17 states there was an increase.

Railroads Spend Money

Expenditures for supplies totaling $7,429,000,000 in the five-year period ended with 1927 were reported today by the American Railway Association for all principal lines of the United States.

Through their purchases, the roads help to keep alive many of the nation's principal industries, the association asserted. The lines annually take about 25 per cent of the nation's entire production of bituminous coal, it was claimed, as well as the same proportion of the cut of timber and 19 per cent of the whole production of iron and steel products.

The total expenditures in 1927 amounted to $1,396,000,000. Some of the large purchases included approximately $347,000,000 for coal, $108,000,000 for ties and another large amount for bridge timbers, $433,000,000 for steel products, nearly $6,000,000 for cement, about $23,000,000 for lubricating oils, and close to $56,000,000 for non-ferrous metals. The total expenditure for supplies in 1927 shows a decrease of approximately 10 per cent by comparison with 1926.

Power Production Sets Record

Production of electric light and power by central stations throughout the United States this year is going forward at the rate of approximately 6,561,000,000 kilowatt-hours per month, according to data collected by the U. S. Geological Survey. This is the highest rate of power output in the history of the United States.

Power production has increased 110 per cent since 1921, the Survey's records show. In that year the output by central stations averaged 3,129,000,000 kilowatt-hours monthly. The monthly average output rate for the period 1921-28 follows:

Year	Increase from 1921 Pct.	Year	Increase from 1921 Pct.
1921	00	1925	64
1922	17	1926	84
1923	37	1927	99
1924	46	1928	110

Record Steel Production

Steel ingot output to July 1 this year is the highest on record. Approximately 24,732,000 tons of crude steel were produced by the mills of the country to that date, reports to the U. S. Commerce Department show. In the corresponding period last year 23,700,000 tons were turned out.

Production from January to June, 1926, totaled 24,154,000 tons. In 1925 it amounted to 22,406,000 tons. Output was 19,737,000 tons in 1924 and 23,213,000 tons in 1923.

The industry as a whole shows little evidence of the slackening of output usual at this season, reports from the steel centers indicate. Unfilled orders on the books of the leading producer exceed by approximately 600,000 tons the amount at this time a year ago. Orders gained over deliveries by about 200,000 tons in the last month, reports show.

COON RIVER SAND COMPANY COMPLETES NEW DREDGING PLANT IN IOWA

FOR several years, the Coon River Sand Company has been operating sand and gravel recovering plants in the vicinity of Des Moines, Iowa. Formerly on the Coon River and later in the city of Des Moines, a modern plant is in operation.

The most recent development of the company was to open a sand and gravel pit and erect a plant at Van Meter, Iowa. This plant was built with the object of furnishing ballast for the Rock Island Railroad and later to become a commercial sand and gravel plant, and the equipment as indicated is being installed as soon as practicable.

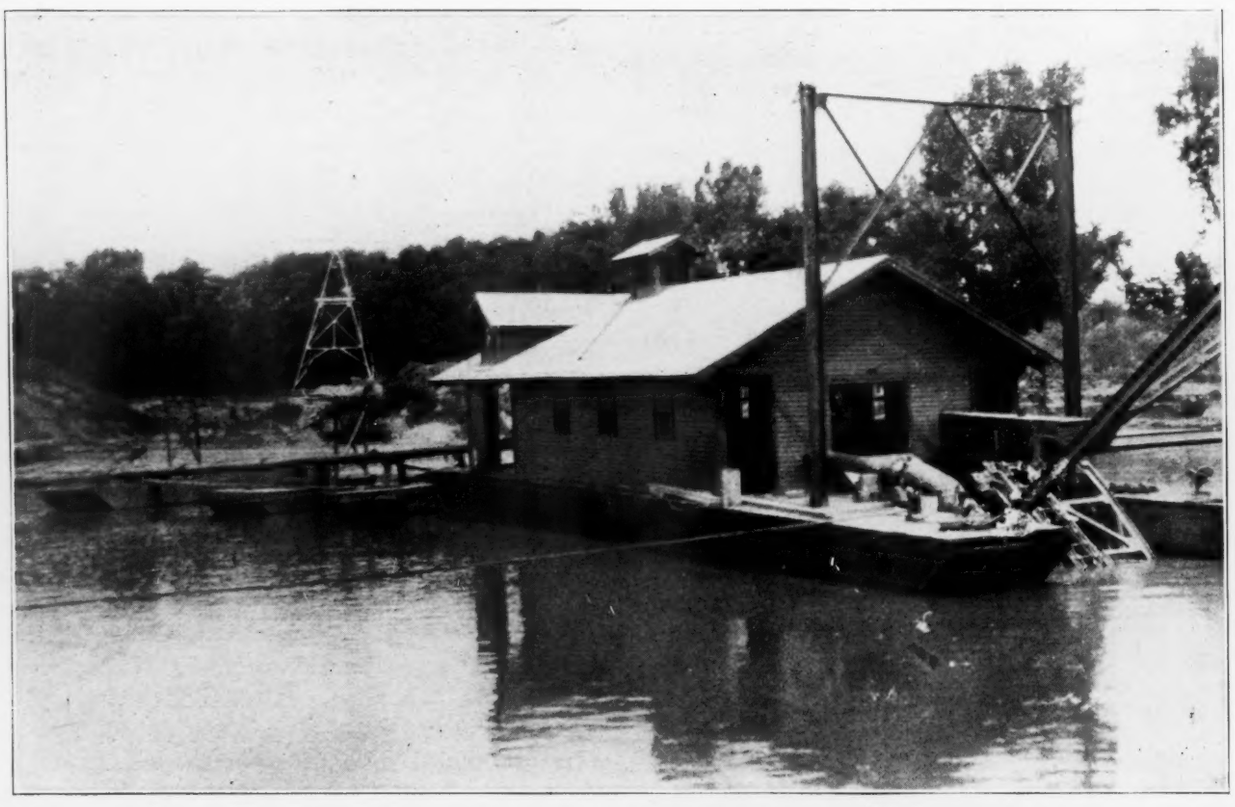
For dredging, an all steel barge with end intake and end discharge, manufactured by the Pittsburgh Des Moines Steel Company, is used. This boat is 26 by 40 feet and 5 feet in depth, made in three longitudinal water tight sections and riveted at the plant. The middle section is 12 by 25 feet, which allows the front of the middle section to be retarded 15 feet. This creates a well 15 feet long by 12 feet wide and throws the weight of the machinery more nearly in the center of the barge and permits the A frame for operating the ladder to stand with a leg on either side of the well.

Material for the suction is loosened by an Eagle Swintek suction screen nozzle ladder, manufactured by the Eagle Iron Works, which also keeps a steady flow of solids by removing the boulders and depositing them at the rear of the nozzle and by digging down and forward to loosen the material to be fed to the nozzle. The agitating equipment is belt driven by a 25 h.p. electric motor. The hoist, which was manufactured by the American Hoist and Derrick Company, is operated by a 30 h.p. General Electric induction motor.

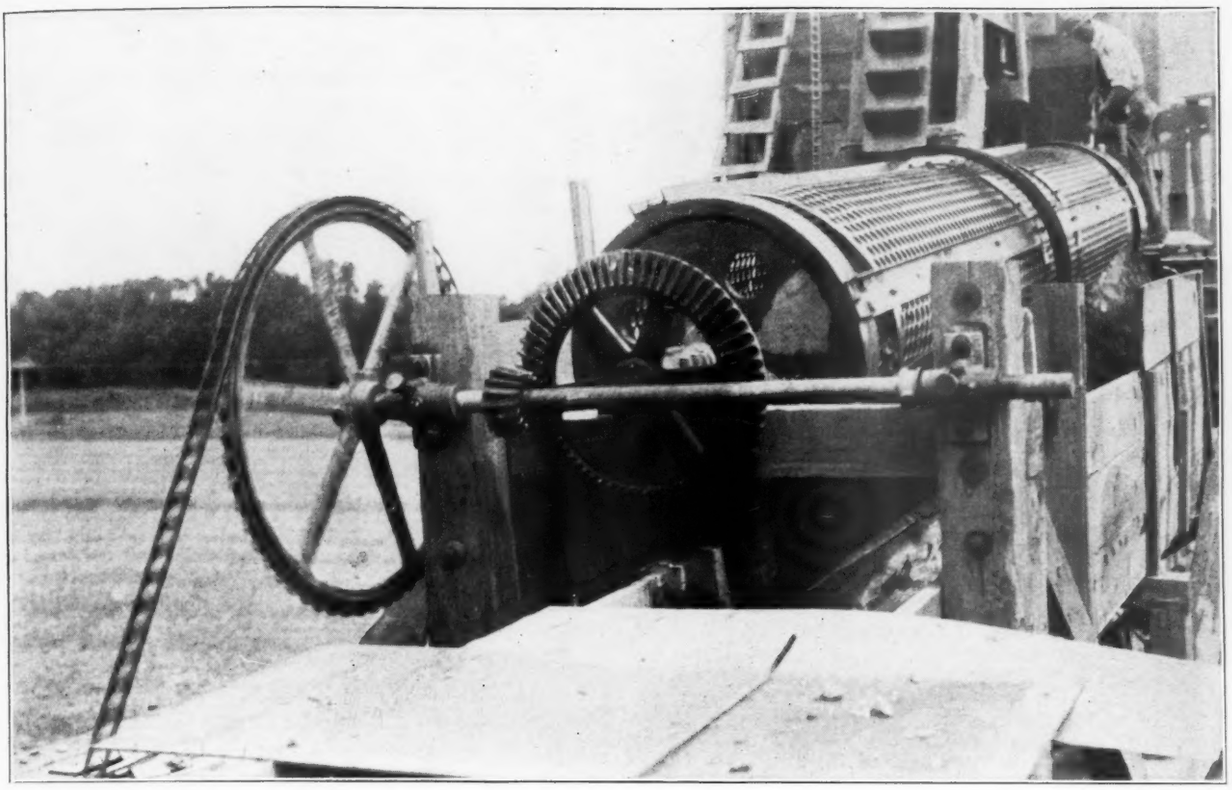
Dredging is accomplished with a 12 inch Amsco pump driven by a 300 h.p. Westinghouse induction motor and having a 12 inch suction and a 10 inch discharge. The line, which is equipped with Goodyear rubber hose, is carried on steel pontoons to the washing and screening plant. For the purpose of making repairs or changes in the Amsco pump, a Yale chain hoist on steel beams has been provided. For priming, a 2 inch Worthington pump driven by a 7½ h.p. General Electric motor is used.

There are two distinct units in this plant. One side is used for washing and cleaning sand and gravel as it comes from the pit to meet the railroad specifications, while the other unit is completely equipped for washing, sizing and screening the different particles for commercial uses, such as highway and building construction. By operating either gate in the hopper, the material will flow as required to either or both the commercial and railroad ballast plants.

As stated, the material for both units is dis-



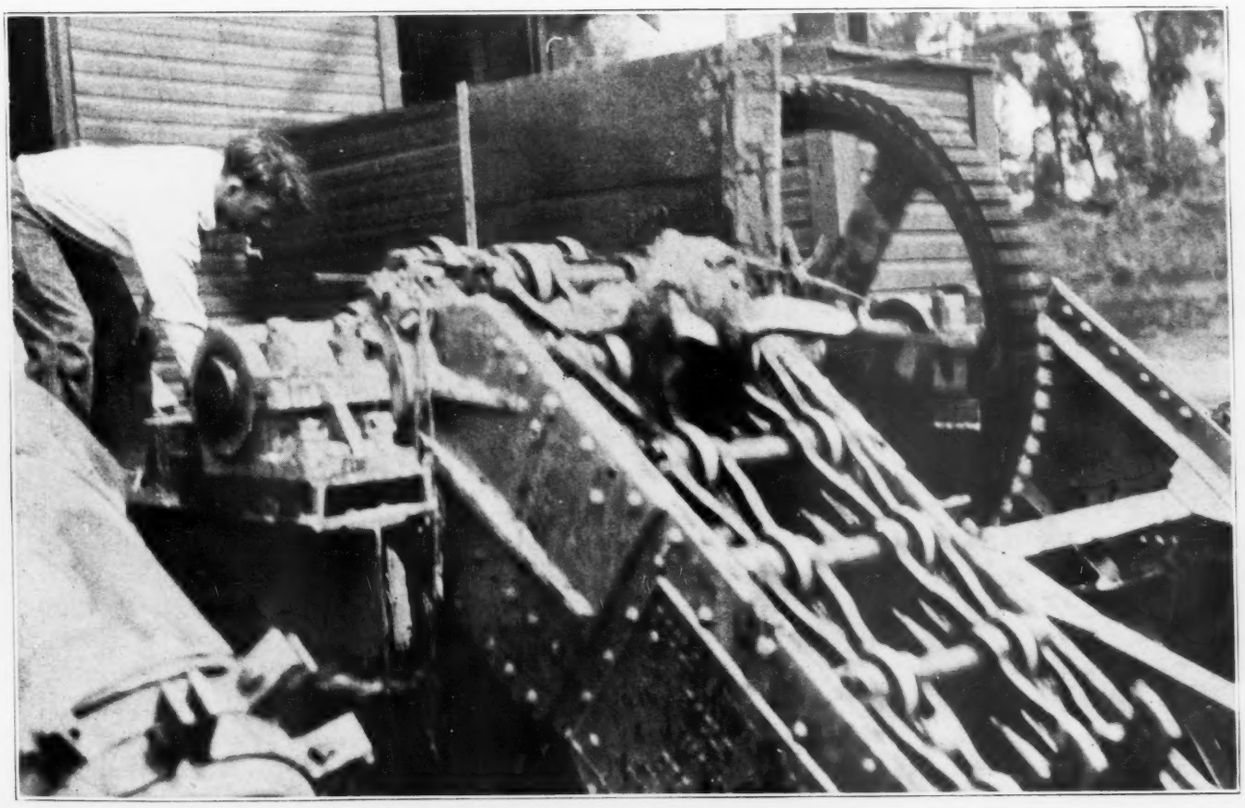
View of Dredge Boat, Showing Well Which Permits Machinery to Be Near Center of Boat



Scrubber and Screen for Preparing Ballast

charged onto a bar grizzly and flows into the same hopper at an altitude of about 38 feet above the pump, and the gate is opened to the commercial side. It flows into a 72 inch by 24 foot Galland and Henning rotary screen with an initial scrubbing section which separates the sand and gravel. This screen is driven by a 20 h.p. General Electric motor.

Water for washing the ¼ to 2 inch sizes of gravel is supplied by two 6 inch Fairbanks Morse pumps, each direct connected to a 25 h.p. General Electric motor. It is taken by a bucket elevator with 185 foot centers to a high flume, where it is



Swintek Screen Nozzle Ladder

Large Boulder Being Deposited at Rear of Suction

washed with the fresh water and passes over horizontal screens, for sizing, into various bins for commercial uses.

Oversized gravel from the grizzly passes to a Number 5 Telsmith gyratory crusher which is belt driven by a 20 h.p. General Electric motor. Oversizes from the rotary screen pass to a 9 by 16 Rogers jaw crusher driven by a belt from the same 60 h.p. General Electric motor that operates the elevator for returning the crushed material to the screen.

For cleaning the commercial sand, two Telsmith settling tanks are used. It then passes through chutes to the sand bins or to the stock pile. For reclaiming stored sand and gravel, a Northwest gasoline crane has been provided.

For preparing the railroad ballast, a rotary washing screen has been installed. The material passes through the gate and into the washing section of the screen and through the screen, which is so arranged, by removable jackets, that all the foreign material and the desired amount of fines may be removed. This material must be carefully prepared to pass railroad specifications for ballast. On leaving the screen the ballast material passes through chutes directly to railroad cars.

General offices of the company are located in the Hubbell Building, Des Moines, Iowa. G. C. Hubbell is president and treasurer; C. V. Ray, general manager; and William H. Gelatt is general superintendent.

New Construction Records

New building begun on June 30 this year broke all records for the first six-month period. The value of contracts awarded during the half-year totals $3,444,868,000, according to the F. W. Dodge Corporation. The Dodge Corporation data include 91 per cent of the construction activity of the country, it is claimed.

The previous high mark was set in 1927, when contracts aggregated $3,187,993,000 from January to June. In 1926 the amount was $3,128,158,000, and in 1925 it was $2,748,695,000. Awards during the month of June are placed at $650,466,200. This is the second highest monthly total ever recorded, being exceeded only by the aggregate of $668,097,200 reached in May.

The 1928 program so far provides, among other items, for $1,530,861,600 to be expended for residential construction, $640,833,700 for public works and utilities, $467,522,200 for commercial structures, and $307,431,800 for industrial projects. A total investment in new building in 1928 of approximately $7,000,000,000 is seen to be in prospect, provided activity during the second half-year maintains the rate set in the first.

Cost of Food Drops

Retail food prices now are at the lowest point since 1926 for this time of the year, according to the newest price study to be completed by the U. S. Department of Labor.

Food now costs the average family approximately 54 per cent more than in the pre-war period, the Department found. At this time a year ago, the price level was 55 per cent above 1913 or one point higher than at present. Two years ago the price level stood at 58 per cent by comparison with the pre-war level and was four points above the current standard. In 1925 and also in 1924, however, prices were lower than this year.

The Labor Department's price studies are based on retail prices for common foods as quoted by neighborhood stores in more than 50 large cities. Quotations are obtained each month for the same foods from several stores in each city.

The foods studied include several varieties of meats, milk, butter and other dairy products, tea, coffee, bread and similar articles which are found on every table. The price trend is shown to have been upward from 1924 to 1926 and downward since the latter year.

MEASURING AND REDUCING LABOR TURNOVER

By J. J. Berliner

LABOR turnover may be defined as the mobility existing in the working force of an organization. It is the shifting in the labor force which results from the fact that for many reasons, men leave their jobs. In short, every employee who leaves the employ of a given establishment no matter what the reason be constitutes a part in the turnover of that concern. A study of labor turnover involves the analysis of the causes and effects of why men leave their employment and the means of preventing such terminations as may be unnecessary and undesirable.

Labor turnover is measured in terms of the proportion of those who terminate their employment in a definite period of time—usually one year is the assumption unless otherwise stated—to the average number who have been on the active payroll during the same period. In other words, dividing the number of men who leave by the number of the total working for the same period of time gives the ratio of labor turnover.

However it must be noted here that there is by no means complete agreement as to what turnover is and how it ought to be measured. There is a second method of considering it which is based primarily upon the principle of replacement and which views turnover as occurring only when the cycle has been completed from the hiring of a worker to the hiring of his successor when he leaves. According to this method, the percentage of labor turnover for any given period is derived by taking the total replacements for the period considered and dividing by the average number on the payroll. Undoubtedly there are many favorable points for this method. The most essential one is the fact that it indicates the success with which the needed working force is being maintained and the needed amount of production being turned out. It assumes, however, that there exists standardization of the plant's production in terms of each worker's day's work and of a standard total day's output of the plant—and these are conditions which are frequently lacking because the necessary degree of control over the volume of production can only begin to be obtained by scientifically managed plants. It is only where standard performance is known that there is a basis of comparison between expected and actual production.

A third method of computing labor turnover takes into consideration the rate of fluxion or the ebb and flow of labor. It consists of the following formula: $R = \frac{A + S}{W}$ in which R is the rate of labor fluxion, A stands for the number of additions to the force, S denotes the number of separations from the force, and W the number of fully employed-worker labor-time units of 3,000 hours put in by the work force during the period concerned. Although this measure has several scientific advantages over other plans, it has as yet not received the attention it deserves. The reason for this probably exists in the fact that in arriving at an approximately correct figure for W in the formula requires a good deal of care in record keeping.

For practical purposes, the use of the first method, namely that based on the ratio of those who terminate their employment to the total working force is still valuable. Measuring turnover of labor by this yardstick has this advantage: it focuses attention on the individual worker who leaves; and it is the individual worker from the viewpoint of analysis and diagnosis of labor troubles that is the one in whom interest is centered. In short, the turnover of labor is not something to be considered by itself, to be measured and discussed only in relation to a standard output. To be sure, it has a close effect upon output, but labor turnover, properly conceived, is rather a symptom than a disease; and like all symptoms it is of interest to the practical person only in so far as it points to the nature of causes of maladjustment, and thus leads to corrective measures.

Workers usually leave a job because of some dissatisfaction and the effort from the administrative point of view must be to discover the source of that dissatisfaction. If the figures of labor turnover are in terms of separations they are, therefore, in terms of dissatisfaction, provided proper allowance has been made in the computation for other non-personal causes.

If all the workers in a department or in a whole plant go out at once, the event is spoken of as a strike; and the board of directors at once inquires of the manager as to the reason for it and the nature of the men's demands. Indeed, the management may be severely censured for letting an interruption of work occur, but the management does not always so readily see that labor turnover —or the largest single part of it—is simple a strike by erosion, about which they should also be greatly concerned. It is the gradual wearing away of the working force one at a time, due to some cause and some demand which is unvoiced in any formal way because an adequate channel of communication or adjustment is not provided. It is exactly as important to find out and meet this demand, when it is a just one, as it is in the case of a strike.

Formula of Labor Turnover

Reduced to its simplest terms, the formula for the determination of labor turnover would be:

$$T \text{ (Turnover)} = \frac{S \text{ (Total Separations)}}{F \text{ (Average force on payroll)}}$$

As it stands however, this formula is too simple to disclose much about the meaning of the figures of separation. Some modifications in the method of computation are essential. Hence it is urged that the figures of workers leaving be itemized in ways that give them significance. An initial division may be made between resignations, discharges, lay-offs, and separations for health reasons. Under one of these headings each departure may be classified.

The figure F may be calculated in several ways; but perhaps as simple a method as any is to use the total weekly payroll figure of the departments in question. If the average force for a year is sought, these fifty-two amounts may be added and divided by fifty-two to give a yearly average. If the figures represented by *S* are obtained in terms of a week, in order to get the standard labor turnover figure, *T* should be multiplied by 52; although the resulting figure will mean only that the turnover for that week was at the rate of such and such a per cent per year.

When, however, fifty-two consecutive actual weekly percentages are available, the total of those fifty-two will give the actual yearly turnover.

For more detailed analysis of why men leave, it is very desirable to divide each of the four major headings into several sub-headings. The following arrangement is suggested, with clear recognition of the revision that it will require as it is used in specific instances.

I Resignations: (a) Better job, (b) Dissatisfaction with wages, (c) Dissatisfaction with work, (d) Unable to get along with superior, (e) Leaving city, (f) Change of vocation.

II Discharges: (a) Careless, (b) Incompetent, (c) Unreliable or irregular, (d) Insubordination, (e) Liquor, (f) Misconduct, (g) Dishonesty, (h) Trouble-breeder.

III Layoffs: (a) Decreasing force, (b) Lack of work.

IV Physical reasons: (a) Ill-health, (b) Injured, (c) Died.

In addition, a separate record should be kept marking each departure as avoidable or unavoidable. This distinction in many cases will be difficult to make as for instance "unable to get along with superior," when given as a reason by a worker of conspicuous emotional instability, is an unavoidable resignation; but then there is the possibility of the fault lying with the superior, and if so it is clearly an avoidable separation for which some remedy should immediately be devised.

Any wide agreement as to which causes for leaving are avoidable or unavoidable will undoubtedly be difficult to secure; but wide agreement is not so much needed at first as agreement of all concerned in one plant to keep its own figures consistently on the same basis over a period of years so that they are valid for purposes of comparison. For after all, their major purpose is to reflect from time to time the success of the management in reducing avoidable causes of dissatisfaction.

Of course, there are no limits to the refinements that can be made in the turnover figures. For example, complications due to the permanent reduction or the permanent increase of the working force during the period in which the amount of turnover is sought have occasionally to be met. In the interest of emphasizing the main idea of analyzing the remediable causes of dissatisfaction, no further modifications in formula or in the forms for recording it are suggested.

Figures showing the gross turnover of labor do not however, necessarily indicate a great deal. The more itemized and localized they may be, the more significant they become. For example, turnover records when presented by departmental divisions often show one or two departments to be the principal causes of high turnover; and when kept by rooms or machines they may indicate that it is one particular operation or one foreman who is causing much of the trouble. In like manner, the segregation of turnover by sex, by age, and by wage groups may reveal discrepancies in company procedure that will otherwise remain unsuspected.

In short, the purpose of any labor turnover compilations should be not to cover blank forms with figures, but to show where dissatisfaction exists, why it exists, and how it may be eliminated.

There is considerable value, also, in figures which show the length of employment of workers who leave. If, as is often the case, the greatest turnover comes within the first six months of employment, it is likely to argue some deficiency in methods of selection or training. If it comes from workers of long standing, then it may indicate little opportunity for advancement in wages or in kind of work. When carefully scrutinized, facts about length of employment of those who leave are likely to be very enlightening.

Finding the Causes of Labor Turnover

The above discussion is of course based on the assumption that the company has accurately discovered the reason of each individual's leaving. Indeed, the absence of a centralized employment office through which all leaves are required to report, makes the chances of getting the true causes for leaving very slim. Workers usually will not or do not tell foremen or timekeepers the real reasons for leaving. But the chances of accurate analysis are greatly increased if some tactful person

in the employment manager's office is required to spend several minutes in considering in private interview with the worker his reasons for going.

One thing to be cautioned against is the danger that the interviewer will put into the departing worker's mouth some reasons which the worker will immediately take up and repeat back without ever disclosing what is really on his mind. The only way to prevent this is for the employment manager to be impressed with the fact that the leaving workers are the ones who feel most strongly about the shortcomings of some aspect of the company's labor policy; and that it is of first importance that their uncolored testimony be secured.

Cost of Labor Turnover

Although labor turnover is not a matter to be dealt with independently, its costs may to an approximate degree be figured separately, and a compilation of the turnover costs for a given job, department, or plan may be exceedingly useful as providing a good argument for changes and improvements, of course, such costs cannot be computed with perfect accuracy, but enough of the items may be segregated or closely estimated to present a conservative statement of the losses in production and in indirect expense due to high turnover.

The following is a list of items of cost which is illustrative if not exhaustive, as showing the charges involved in labor turnover, which are not ordinarily taken into account.

These costs may be roughly divided into overhead costs and operating costs:

Among the overhead costs are:

1. More rapid depreciation of machinery because of ignorance or lack of skill of new workers.

2. Extra floor space and extra machines to provide against idleness of a certain amount of machinery due to shifting labor.

Operating Costs may include any or all of the following:

1. (a) Time spent by foremen or superintendent in discharging a worker where that is the manner the vacancy occurred.
   (b) Time spent by foremen or other workers in training the new employee.
   (c) Time spent by clerks on additional payroll or other records.
2. Machine Costs, covering:
   (a) Time machinery is idle when a new worker cannot be obtained immediately.
   (b) Idle machinery for tempory stoppage due to ignorance or lack of skill of new worker.
   (c) Repairs to machines or renewals of tools broken for the same reason.
3. Material Costs, including:
   (a) Waste or damaged material due to ignorance or lack of skill of new worker.
   (b) Difficulties in subsequent processes due to poor work by new employees in previous processes.
   (c) Lower production while new employee is working up to his best skill.
4. Additional accident cost due to higher rate of accident among new employees.

It should be noted here that too much stress should not be placed on the fact value of figures of labor turnover and its costs. Conclusions should be drawn always with caution, until methods of compiling them and the reasons for compiling them are known. As a general index and barometer of the trend and current of the labor organization, labor turnover figures, if carefully prepared, are useful.

A situation which is sometimes met and in which the figures if viewed superficially fail to reveal the fact that there exists a rapid turnover among 15 or 20 per cent of the force, while the other workers remain fairly constant. What is needed is a measure of labor stability. According to the United States Coal Commission, labor stability is defined as "The stable force is that group of individuals who were not separated from the payroll during the years. An absence of two or more pay periods constitutes a separation."

The ratio or percentage of stable force is computed by dividing the number in this group by the average working force. It permits the employment management to recognize the real magnitude of the labor turnover by noticing the proportion of the force among which it takes place. For example, one company showed a labor turnover percentage of 198 and a stable force percentage of 40. These figures mean that practically twice the average number of employees on all jobs left only a little more than half the jobs in the district. The labor turnover figures alone do not show the seriousness of this situation.

Account must be taken of the fact that some turnover may be a natural measure of self-defense against the monotony of certain kinds of work. A degree of shifting from one plant to another may under present conditions be a healthy and socially desirable protest against present methods of utilizing people. At any given moment in one plant, it may be impossible to do much to compensate for the sameness and dullness of the work and in such a plant to attribute inefficiency to the employment office because of a high labor turnover is unfair. This is a use of figures without taking into consideration any other factors.

There is, indeed a real danger that managers who have installed employment departments will take it as axiomatic that the amount of turnover

is a direct index of this department's efficiency. It may be or it may not; but until the figures are carefully analyzed and compared with those of previous years and of other plants similarly situated, it is unscientific to draw this conclusion.

Remedies for Labor Turnover

If turnover is a symptom of some maladjustment, the cure should remove the symptom. One outstanding remedy is the introduction of functionalized employment offices in charge of trained executives of a superior type. This invariably results in an immediate and marked reduction in the amount of labor turnover. The fact that some offices specialize in selection and in the subsequent adjustments has almost without exception brought labor turnover within a one year period from an abnormal and excessive figure to one more reasonable and normal. The evidence obtained from the figures of many companies is conclusive on this point.

Labor Loss

Finally, mention should be made of a somewhat more elaborate plan of computing all the labor losses in terms of them in productive hours which the plant suffers each day or week. Under this method, labor loss is conceived as a combination of the following measurable factors:

1. Original failure to secure the right or standard number of employees.
2. Failure to maintain the number of employees regularly up to standard.
3. Hiring new workers to replace lost ones.
4. Poor attendance (absenteeism and tardiness).

This method is based on the assumption of standard working force and a standard flow of production. The figure of labor loss is based on divergence from this standard caused by the factors just listed above. The only criticism of this method lies in the fact that the great majority of plants could not use it because they have as yet not determined what for them is a standard work force or a standard day's work per unit of man power. This method requires not only good cost accounting records, but good planning, routing, and scheduling procedure.

Bond of Melted Slag with Iron

Dr. A. Guttman, in "Use of Slag in Building Industry," published in Germany, 1919, cites some experiments carried out which revealed that iron can be set in liquid glowing slag just as it can in wire glass. The iron is thoroughly embedded and is as effective as iron reinforcement in concrete. Applications of this armored blast furnace slag suggested by Dr. Guttman are for posts, stanchions, pillars, pipes and roofs.

Farm Wages Increase

Farm workers in the United States are receiving an average of $2.39 per day without board for their labor this summer, according to the U. S. Department of Agriculture. This is shown to be a slight increase over the average wage of $2.34 paid in the spring.

Wage levels for agricultural labor are reported quarterly for each state by the Department. The present report deals with rates of compensation on July 1, 1928.

In many states farm wages are found to be well above the average for the country as a whole. The level in New England and in New York, New Jersey and Pennsylvania, ranges from $3.10 per day to $3.80, with an average of $3.48. From Montana to New Mexico and west through the Pacific Coast states the average is $3.28 per day.

On farms along the Atlantic seaboard, from Delaware to Florida, a level of $1.75 per day prevails. In the states south of Kentucky and west of Texas the average is $1.67.

While wages are reported as somewhat higher now than at the time of the April survey, farmers generally are able to obtain their harvest labor at more favorable rates than a year ago, it appears. The general level at that time stood at $2.44 per day, the Agriculture Department data show.

U. S. Income and Expenditures

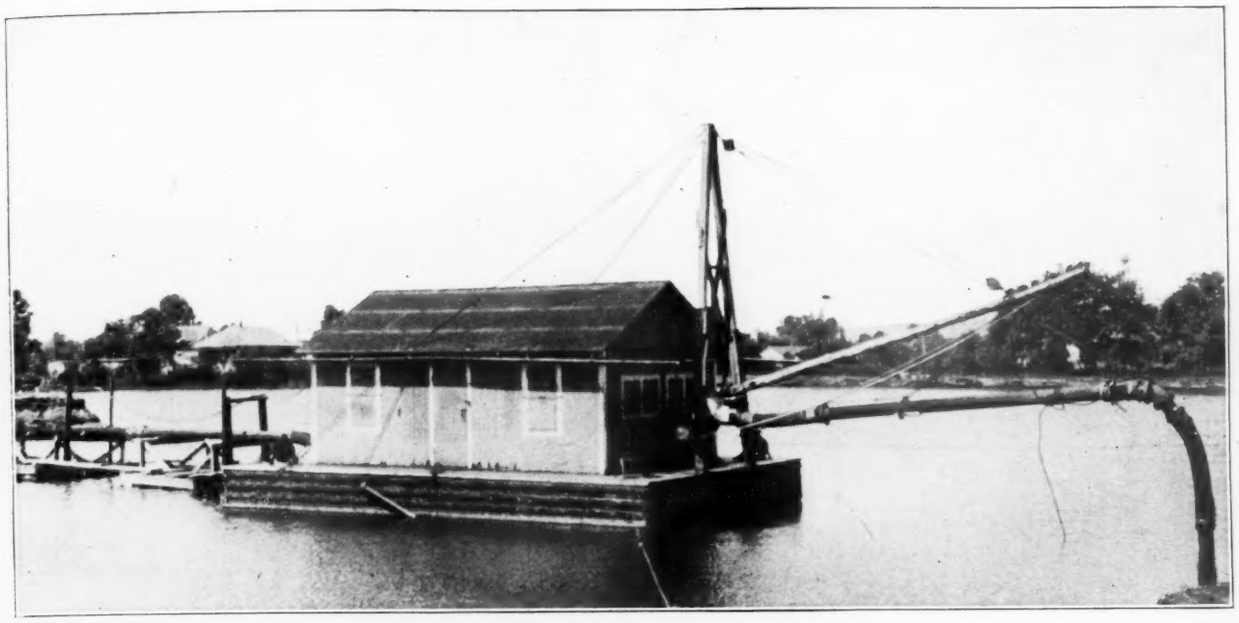
Income of the U. S. Government for the year ended June 30 totaled $4,042,000,000, the Secretary of the Treasury announced. Expenditures during the same period amounted to $3,644,000,000.

Receipts for the year are found to be slightly less than in 1927, but greater than any other year in the last six. Expenditures are the highest since 1923. A portion of the 1928 disbursements are properly chargeable against 1927, however, the Secretary's statement pointed out.

The aggregate of tax receipts for 1928 is placed at $3,364,000,000, or $111,000,000 less than in 1927. Income tax payments are shown to amount to over one-half the entire revenue of the Government, totaling $2,174,000,000. Customs yielded $569,000,000, and other internal revenue sources $621,000,000. Miscellaneous receipts were $678,000,000.

The Treasury surplus for the year is given as $398,000,000, compared with a 1927 surplus of $635,000,000. A large portion of the surplus for 1928, it is stated, has already been employed to improve the financial position of the Government by reduction of the public debt.

PRODUCE 1,000 TONS DAILY ECONOMICALLY BY PUMPING MATERIAL



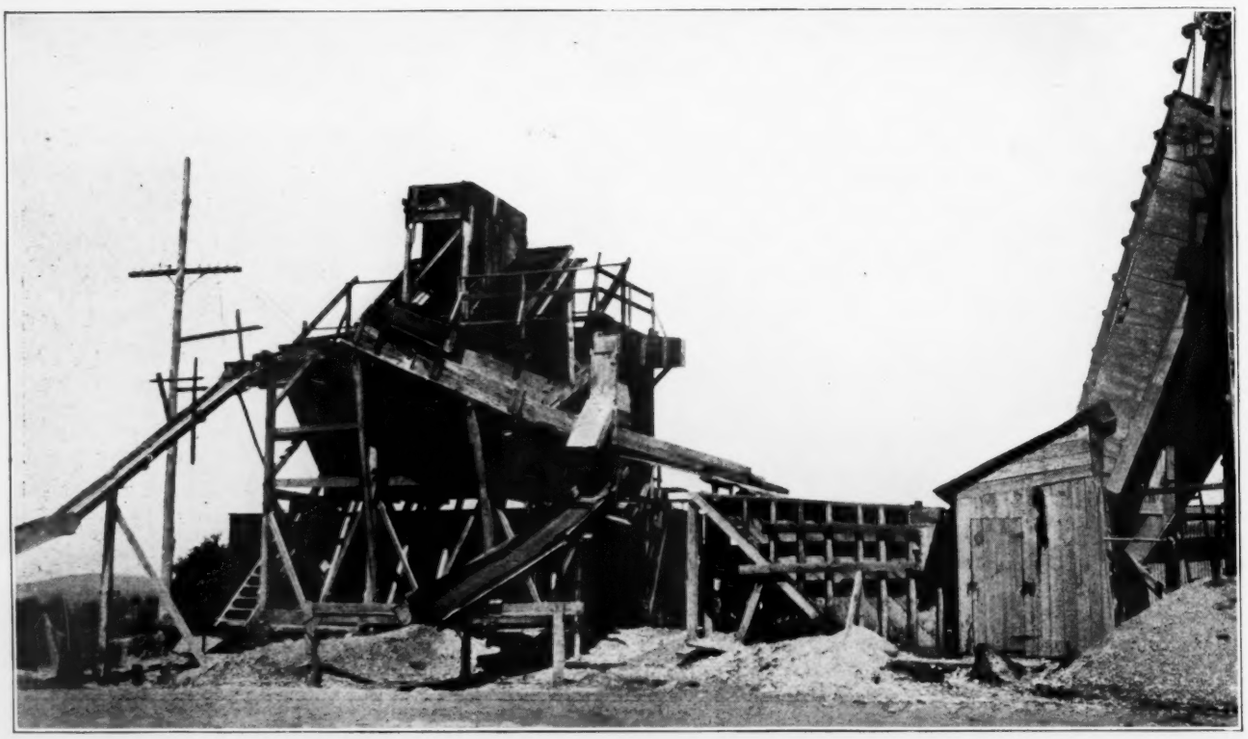
Showing Float, Boom and Suction Line With Two Flexible Connections

RIDNER BROTHERS have a hydraulicking plant at Kenvil, New Jersey, capable of producing about 1000 tons of state road specification sand per day. It is close to some of the Seguine plants and also to the Lackawanna R. R. from which there is a siding to the bins.

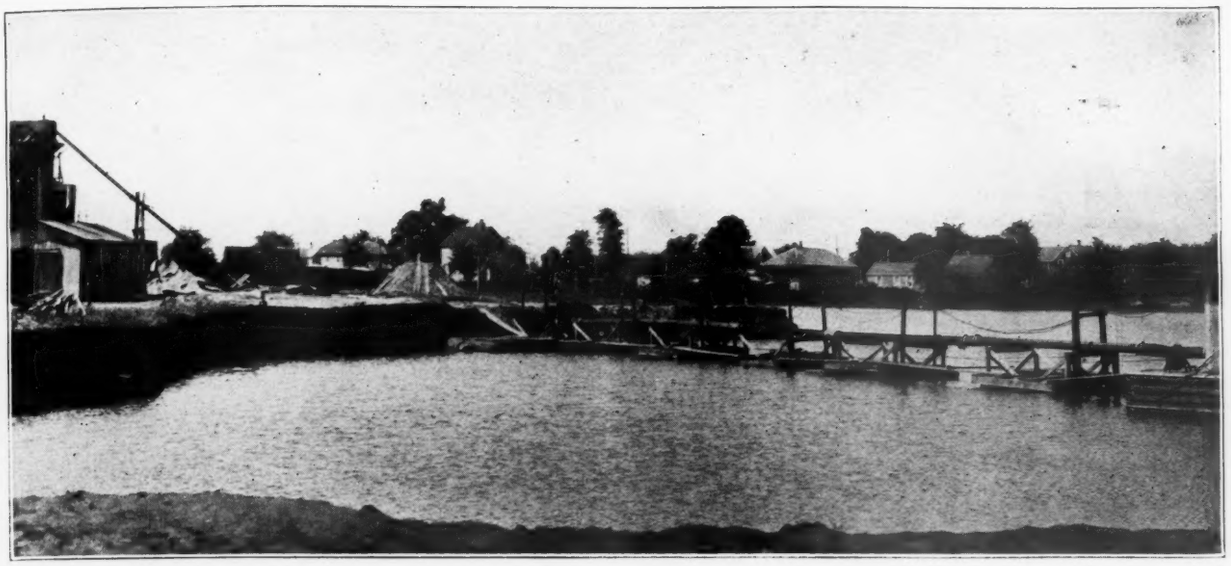
An 8 inch Morris centrifugal pump driven by a 100 h.p. motor on a float supplies material. The discharge line from this empties into a box at the top, from which the material flows in two directions over two parallel stationary screens. The sand drops into settling tanks from which there are spouts at the bottom for the loading of freight cars or trucks. The overflow from the settling tanks passes off through a trough.

Material which does not pass off over the stationary screens flows into a chute and through this to a bin on the ground. This has a sloping

Bin and Elevator from Oversize Bin to Revolving Screen



Upper Left, Loading from Bin; Right, Loading from Settling Tank; Lower, Receiving Box and Screens



Discharge Line on Pontoons, Leading to Top of Plant

bottom toward an elevator which delivers it to a revolving sizing screen under which there are bins. Spouts at the bottom of these bins serve to deliver the gravel to trucks or freight cars.

A Lidgerwood steam hoist is used to move freight cars. Godfrey-Keeler upright boilers supply the steam for this and for the engines which drive the elevator and revolving screen. The plant is quite simple and should be economical to run.

Strength of High Quality Portland

The compressive strength of high quality Portland cement after two and three years water curing is much greater than that for ordinary cement. The difference in percentage is about the same after two years as after seven days. The tensile strength difference is greatest after the first day, but thereafter the difference becomes less until after two years, the high quality cement is about 10 per cent greater in tensile strength than the ordinary Portland. With combination cure, the tensile and compressive strengths fluctuate up to 6—9 months. The latter then increases slowly, the former very rapidly. The compressive strength is greater with combination curing than with water curing after 2—3 months. Only after 5 years do the strengths by both curing methods approach; after 10 years the strength of cement cured by combination method is still higher than that cured only by water. With simple air curing, that is one day in damp air then in ordinary air both tensile and compressive strengths, even after longer curing periods, are less than those obtained by combination curing (1 day in damp air, 6 days under water, then in ordinary air.) In principle the curing by combination methods and by air are similar. —Haegermann (Tonindustrie-Zeitung, 52, 119, (1928)).

Big Home Construction Program

Homes for approximately 2,633,428 families were provided by new construction undertaken in cities of the United States in the last six years, according to a study made by the U. S. Labor Department of building permits issued in 257 leading cities during that period.

More than 44 per cent of the dwelling accommodations built during the six years consisted of separate homes, the figures reveal. Permits for 1,167,559 single dwellings were issued in that time. Apartment houses provided 38 per cent of the space. The remaining 18 per cent consisted of two-family dwellings.

The peak year in residential building was 1925. In that year 491,222 families were provided for by new construction. In 1926 the number fell to 462,214 families. The total of 406,095 families housed in 1927 was the lowest of any year since 1922.

Residential building throughout the United States is proceeding at a record rate in the present year, the latest data show. The same rate maintained during the coming months will probably result in a greater volume of home building in the cities in 1928 than in any previous year.

Pure Water on Quick-Setting Cements

Contrary to popular opinion pure water does not readily break down quick-setting cements such as are used in water mains. If pure ingredients are used and the mix is made rich, good results may be expected. At least 7 installations over 20 years old were still found to be in good condition. Mourral. (Genie civil *92*, p. 121-2, 1928). C. A.

THE HYDRAULIC MINING GUN

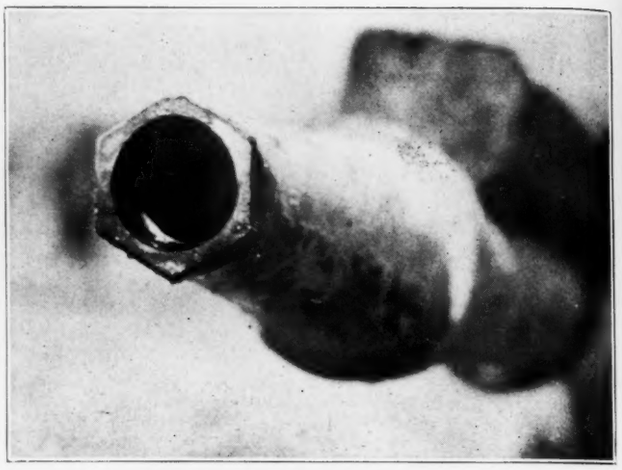
By W. H. Taylor
Superintendent of the Coronet Phosphate Company

THE hydraulic mining gun as manufactured by the Georgia Iron Works and the Universal Nozzle Company is used in the phosphate fields of Florida. These guns are simple, durable, compact, comparatively light, easily and quickly moved from one place to another, and extremely easy to operate. Six men, with handsticks and wrenches, can uncouple, move them ahead and couple them back, ready for operation, in a very few minutes. They are coupled to the pipe with four machine bolts and a drop gasket, which can be taken apart and put back together very quickly.

A movement of the hand will move the gun to almost any angle, in either a horizontal or vertical plane, which renders it possible for a boy to operate. It is fully revolvable on ball bearings, and works on a ball joint fulcrum, which makes it possible to operate at almost any desired angle or elevation.

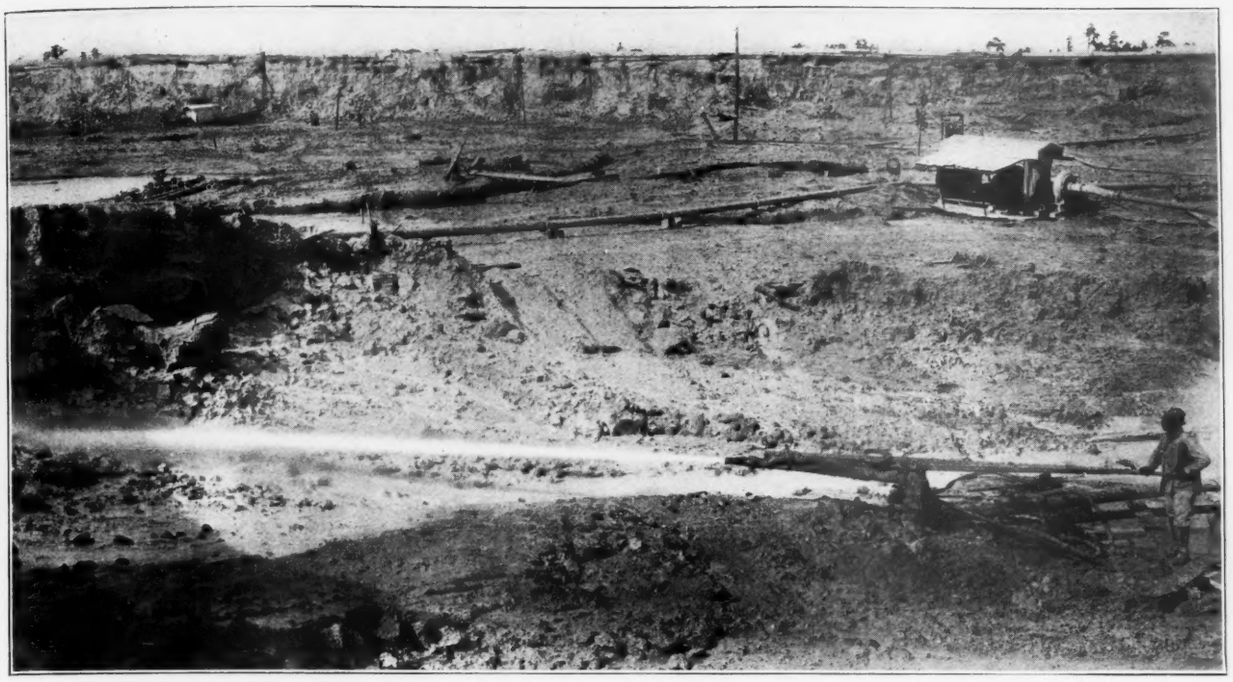
The base, leather gasket, ball bearings, races, wearing rings, discharge ell, tension springs and bolts, nozzle, barrel, and threaded end for screwing on nozzle, are all made in separate pieces, and are easily and quickly taken apart for undergoing repairs when needed.

These guns have been found to operate almost continuously for a number of years with very few repairs needed. About the only repair parts required, for a long period of time, are leather gaskets. These gaskets operate under an enormous pressure and blow out periodically, on account of the leather deteriorating. The gaskets can be changed quickly and are not very expensive. These guns are manufactured from the very best grades of steel, and cast iron, and are mechanically bal-



The Hydraulic Mining Gun

A Typical Deposit Being Worked Hydraulically



Showing a Hydraulic Mining Gun in Operation

anced, which accounts for their easy and efficient operation.

They are shipped to the operators assembled, ready for service, with the exception of nozzles, a wooden foot block, which works under the base on the ground, and a wooden handle which is bolted to the barrel with two "U" bolts.

The desired size nozzles can be obtained from the manufacturers of the guns. The foot blocks are made of six by eight inch timbers, two feet long, beveled back at each end on the top side, and bolted to the gun base with two long machine bolts. The handles are made from four by eight inch timbers sixteen feet long. These timbers are drawn down gradually, from a point ten feet from one end, to comfortably fit a man's hand, the other end is drawn down gradually in the other direction, from a point six feet from the end, to about four

Showing Method of Running Two or More Guns

Playing Two Guns Against Each Other

inches wide at the termination. This makes a neat sturdy handle which helps balance the gun, gives constant service, and lasts for a long time, when made of yellow pine.

When there is a problem of moving the earth, the hydraulic mining gun, used in conjunction with heavy duty sand pumps, cannot be equalled. Hydraulic guns are moving as high as seven hundred cubic yards per hour in the Florida phosphate field, and at the same time make the mining operations, which follow in behind the overburden stripping operation, much more flexible. This is made possible by there being no limit as to the width of the pit, as long as there is a place to dump the waste.

The overburden over the phosphate fields ranges anywhere from ten to fifty feet in depth, and varies in composition, anywhere from soft loose sand, iron rock, and sand rock boulders, to hardpan. In the case of the latter, extensive blasting with dynamite is necessary in order to move it. The amount moved varies in accordance with the depth and hardness. In some cases the amount moved is limited to the amount which it is possible to drift to the sump hole. In other cases where the bank is deep and soft, the limit is the amount which the pump will handle. There are varying conditions to meet, but the hydraulic gun, when properly used and assisted, will meet them all.

The guns are equipped with nozzles, which screw on and off. The nozzles vary in size from one and one-half to two inches in diameter, according to the amount of water desired. Operating two guns in one mining outfit has been found to be the most efficient method of operation. High speed centrifugal pressure pumps (which pump against about a five hundred foot head, and deliver from two to three thousand gallons of water per minute at two hundred pounds pressure to the square inch) are used for furnishing three guns water for operation. The powerful stream of water delivered from these guns quickly cuts the earth bank down, disintegrates it, and drifts it through a system of ditches to a sump hole, where a heavy duty sand pump sucks it up and discharges it out on the dump, or into the washer, as the case may be. In some cases where the bank is soft and the requirements of production are not so high, smaller streams at lower pressures are used, to accomplish the same results.

Jets, attached to a wooden handle and a fifty foot length of flexible hose, and operated from a valve on the side of the gun, are used for putting down the sump holes and cutting the drift ditches. Three guns that branch from a three way lateral equipped with three valves, are used in each pit. One drift ditch is cut from the sump hole to the bank opposite each gun, and two of them are kept in constant operation. The third gun is installed in order to prevent any lost time in operation, in case something goes wrong with one of the other two, and when moving them ahead one at a time as the bank is cut away.

Binding Power of Cements

The binding power of a cement or a plastic mass is defined as the weight in kg. required to pull a metal rod 8 mm. in diameter from a hole 10 mm. deep and 10 mm. in diameter in which the rod is embedded in a porcelain plate by means of the cement under test. For zinc oxychloride cement, with borax to retard setting, maximum binding power is obtained with 4 ZNO : 1$ZnCl_2$, when the zinc oxide used has been well burnt. For magnesium oxychloride cement, with or without a filler, the maximum binding power is obtained with 4 MgO : 1Mg Cl_2. The greatest strength is obtained with sand as a filler, calcite is almost as good, but kaolin is appreciably inferior.—Nagel and Grüss. Wiss. Veröff. Siemens-Konz. 1928.

SAND AND GRAVEL PUMPING PLANT ADOPTS NOVEL SCREENING PLAN

By F. A. Westbrook

View of Dredge and Equipment

THE Progressive Sand & Gravel Company of Fairlawn, N. J., produces two types of material—run of bank, which is suited for ordinary concrete foundation work and washed sand and gravel to comply with the state road specifications. As Mr. Hartmann, the superintendent, says, he can sell all the bank material that he can dig out. This is due, of course, to the proximity of the plant to the city of Paterson, N. J., and the fact that it is in the midst of a generally well populated and rapidly growing district.

The bank is excavated by means of two shovels—

View of Shovel at the Bank

Partial View of Dredge, Showing Pipe Line on Pontoons

View of Another Shovel at the Bank

a P. & H. and a Northwest. The material is not graded as to size. There are very few cobbles and when found they are simply thrown out by hand. They scarcely, if ever, run over 10 inches in size. This class of material is taken away mostly in contractors' trucks. Cobbles are sold also when a sufficient quantity has accumulated.

As the pit is lowered it will become necessary to excavate by hydraulic methods. At the present time there is a good sized hydraulic operation for the production of the state road specification material adjacent to the pit.

The equipment for this consists of a dredge on

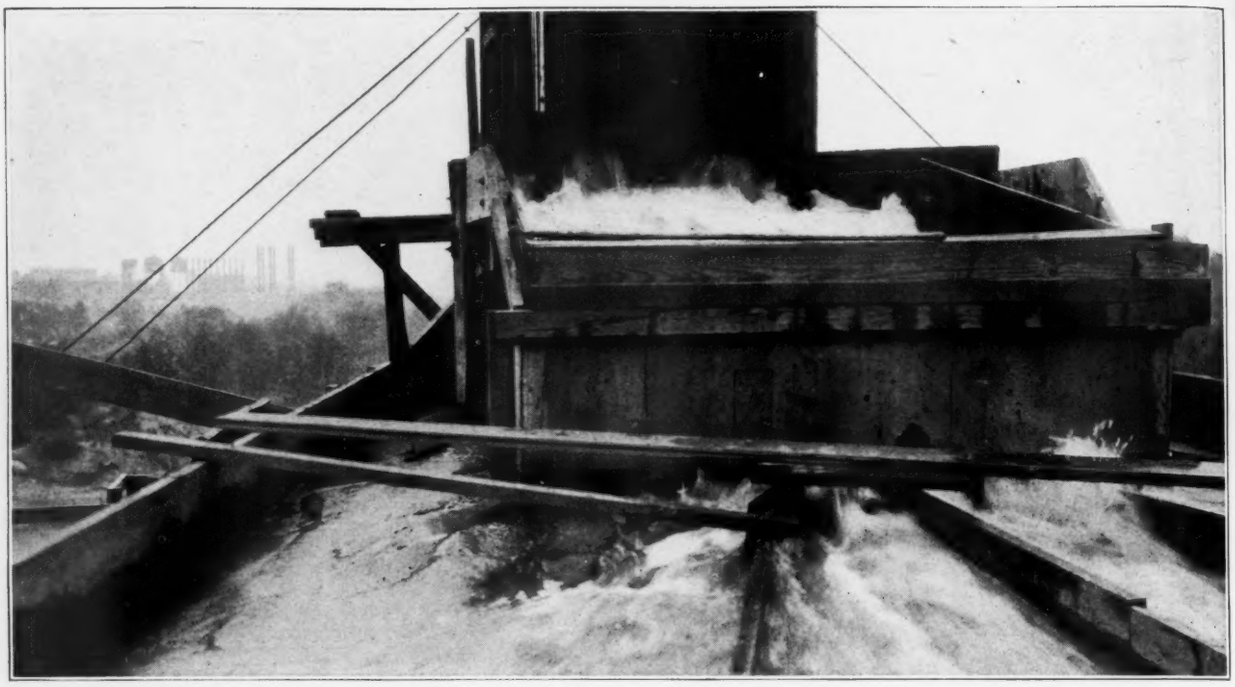
Showing Bottoms of Settling Tanks

View of the Bin Gates

which is housed the 10 inch Amsco centrifugal pump driven by a 200 h. p. General Electric induction motor. The suction end is provided with a home-made cutter driven by a 30 h. p. motor and there is a 10 h. p. motor for the priming. Standard cast iron pipe is used on the pontoons from the float to the foot of the incline to the top of the plant. The production with this machinery is 750 yards per day.

Material is pumped up the incline through Naylor pipe to the top of the plant at an elevation of 68 feet above the water level, and is discharged on to a stationary screen set at an angle of 45 degrees with the horizontal, as shown in the diagram. This screen, set in a hopper, has 1 by ¾ inch openings. The oversizes slip off into a bin. Material passing through this screen drops to another inclined stationary screen having 3/16 by 3/16 inch openings. This permits the sand to pass through to the four Telsmith settling tanks and the overs go to a separate bin. When ⅜ inch gravel is wanted the upper half of the second screen has 3/16 inch openings and the lower half 3/16 inch

General View of Plant, Showing Pipe, Incline and Steel Bins



Screens at Top of Plant. Sand and Water Divided Into Four Streams to the Four Settling Tanks

openings. W. S. Tyler, "Toncap" screens are used here.

The bins are of steel erected by the Dover Boiler Works and are rather an impressive sight. They are provided at the bottom with Telsmith Duplex bin gates for the loading of trucks. All material from this plant is shipped by truck. The company owns three Backhus trucks equipped with St. Paul dump hoists and a great deal is taken away in contractors' trucks. There is a good demand for all sizes of washed material.

Of course the call for specification sand is more or less spasmodic, depending on the road construction in progress at any given time. When the work is going on the demand far exceeds the rate of production, so large stock piles are accumulated during the intermediate periods. One of the shovels from the bank is then used for loading the trucks.

Mullite

Mullite, containing 72 per cent or three molecules Al_2O_3 to 28 per cent or 2 molecules SiO_2 is prepared by the treatment in an electric furnace of a mixture of minerals high in aluminum silicate content, such as cyanite, andalusite or pyrophillite, with an amount of approximately pure alumina necessary to bring the ratio of alumina to silica to the value indicated above. The added alumina may be obtained from bauxite, diaspore or alunite or may be natural corundum.—J. S. Withers. (British Patent 289,500.)

Action of Corrosive Waters on Concrete

The most important damage is caused by sulphuric acid, either in combination as in sea water or free in naturally acid water. Ordinary concrete can be made resistant by producing a dense non-porous aggregate of uniformly sized materials. At least 400 kg. of cement per cubic meter (1,000 lbs. per cu. yd.) must be used. Painting with bitumen is beneficial and better than covering with clinker and cement. Aluminous cement with 7 — 50 per cent alumina is very resistant to magnesium sulphate, but its behavior in the presence of sodium sulphate is doubtful. The resistance of pozzolana is very great to corrosion as shown by the existence of Roman water mains in good condition today. The effect of its addition to concrete is to increase the density and to liberate lime, which acts protectively. It can be used only with slow setting concrete. Cements prepared from blast furnace slag are similar in this respect; a mixture of portland cement clinker and blast furnace slag may be used. Mixtures made from acid slags have not a high initial strength, but if the clinker content is low they are very resistant to salt water. Aluminous slags have the best "hydraulic qualities" of any but are not so resistant to corrosion as might be expected. Basic slags and those containing magnesia make good cements but they are not resistant to salt water. Generally speaking, all these cements have less initial strength than portland cement, but greater resistance to corrosion.—R. Grün. (Chem. Fabr., 1928, 281, 294, and B. C. A.)

PENSION SYSTEM

Part Two

IN PART one of this article, an effort was made to establish good and sufficient reasons for a pension system and relate the main objects to be obtained by an intelligently planned pension system. Among the reasons given for providing a pension system were a desire to reward employes who have rendered unusually long service; to provide for the old age of dependent, superannuated employees; to increase efficiency first by eliminating the incapacitated employes on a humane basis and second to stimulate the working force; a desire to hold the worker on the job and reduce labor turnover; and a desire to exercise disciplinary control over workers. Several of these topics were discussed in the previous installment and the remainder follows.—Editor.

Pensions for Reducing Labor Turnover

A hope that pension systems will reduce the enormous labor turnover so characteristic of modern industry has been one chief reason for their establishment. Yet on this point it is possible to say with assurance that such systems are disappointing. The testimony of nearly all employers who have introduced pension systems is that the effect upon labor turnover in the case of workers under middle age is small, and often negligible. For workers nearing the retirement age the prospect of a pension apparently is a decided incentive to continuance in the service. But the very fact that workers have remained in a given establishment until such age is of itself evidence that they would be likely to continue if there were no pension system. There is the further practical consideration that the worker past middle age has sufficient inducement to continue merely because of the difficulty involved in finding a new position. The reluctance of Industry to employ men over fifty years of age, or even somewhat under that age, is proverbial.

To summarize briefly the preceding discussion it may be concluded that a private employer is under no compelling moral obligation to provide for the support of his superannuated employees in their old age. Nor can a pension system primarily be regarded as a method of rewarding faithful service, although this purpose may be present. It may further be concluded that the prospect of reducing labor turnover, or of exercising disciplinary control over workers, does not promise results of sufficient importance to warrant the expense of a pension system, while the latter purpose is in many respects inherently objectionable.

It follows, therefore, that the one controlling justification of a pension system from the employer's standpoint is that it will increase efficiency, primarily through elimination of superannuated and incapacitated workers, and possibly by building up a larger amount of goodwill and interest among the active force. Although some of the other purposes discussed are important, they are incidental to the primary object of increasing efficiency.

While in many cases it is doubtful whether such efficiency is attained, this failure may be due to imperfections in the plan or to errors in administration. A sound retirement system should facilitate the problem of dismissing superannuated and dependent workers. There may also be some increase in the efficiency of the active force, but the evidence on this point is by no means convincing. To the extent that a pension system does actually increase efficiency it merits most careful consideration.

Increase in efficiency, however, is not in itself a complete justification of a pension system. Not only must a pension system be effective, but it must be inherently sound and equitable, and must not produce consequences injurious to the worker or to society as a whole.

Reasons for Failure of Pension Systems

The reason why industrial pension plans in many instances have not worked out successfully in practice is that executives responsible for their construction have not taken into consideration the fact that the number of employees qualifying for pensions during the first years the plans are put into effect is referable to conditions existing at the beginning of the qualification period, say 25 or 30 years previously. The number of pensioners so qualifying is not indicative of the great payroll expansion that has taken place in the meantime.

Initiators of pension plans have frequently overlooked these facts, i. e., that an increasing number of future pensioners were added to the list of employees each year so that maturities will show a considerable annual increase, and that, if pensions are based upon a percentage of the salaries paid over specified periods, the amount of annual wage has almost invariably increased. The weakness, then, of most industrial pension plans is the neglect to analyze the circumstances thoroughly and to provide for the maturities of additional groups of employees each year. A curve drawn on a chart descriptive of the increase in the amount of pension payments would show sharp elevation after the first few years. This rate of increase is so marked that the management begins to realize that something is radically wrong with their pension policy.

A brief study reveals that a continuance on the basis as adopted will become practically impossible. Therefore, the plan must be abandoned or revised.

Experiences of Railroad and Industrial Corporations

The actual experiences of two representative American companies over recent years will serve to point out several interesting aspects of the problem. The first illustration is that of the Baltimore and Ohio Railroad Company, which has had a plan in operation since 1884. The actual payments to pensioners have been as follows:

1885	$ 7,354	1905	$ 73,322
1886	18,125	1906	82,972
1887	20,669	1907	95,310
1888	23,438	1908	112,356
1889	24,160	1909	129,356
1890	25,100	1910	157,273
1891	27,894	1911	174,746
1892	22,381	1912	193,908
1893	31,954	1913	212,645
1894	34,457	1914	234,292
1895	34,800	1915	266,538
1896	34,726	1916	295,652
1897	46,346	1917	312,623
1898	50,242	1918	321,247
1899	52,117	1919	331,443
1900	49,026	1920	352,390
1901	55,830	1921	380,013
1902	63,143	1922	407,786
1903	64,730	1923	435,502
1904	67,199	1924	456,885

After forty years of operation, there was no evidence that the peak had been reached. In fact, it was almost certain that the annual increase would continue for many years. The number of eligible employees in 1884, at the time the plan began, was 16,848, and the corresponding number of eligibles in 1924 was 54,706. The number of pensioners in 1915 was 1,036 or 47 per cent of the 21,722 who were on the eligible list 25 years previous, or in 1890. At the same ratio (4.7 per cent of 54,706 eligible employees in 1924), the number of pensioners in 1949 (twenty-five years after 1924) will be 2,571, which compares with 1,290 on the pension list in 1924.

The second illustration is that of the United States Steel Corporation. This plan has been in operation since 1911 only, and is somewhat affected by a change made in 1915, whereby the age limit was increased from 60 to 65 years, and the service period from 20 to 25 years.

		New Pensioners Added		
Year	Pensioners	Annual Payment	Years of Service	Monthly Pension
1911	1,606	$ 281,457	30.55	$20.90
1912	1,843	358,780	29.51	20.40
1913	2,092	422,815	29.84	21.30
1914	2,521	511,967	29.89	21.00
1915	3,002	659,389	29.09	20.85
1916	3,013	711,130	33.23	25.00
1917	2,933	712,508	32.24	22.65
1918	2,861	709,059	34.77	27.35
1919	2,940	733,707	32.31	26.75
1920	2,969	779,766	34.37	34.35
1921	3,437	947,879	34.90	38.60
1922	3,886	1,266,661	35.40	40.65
1923	4,054	1,448,112	34.50	43.25
1924	4,478	1,683,920	35.20	43.80
1925	5,084	2,068,652	35.10	45.10

Again, it is clearly evident that constantly increasing pension appropriations will be necessary for a great many years to come. As in the preceding case it is significant to note that the payroll of the Steel Corporation has grown from 196,000 in 1911 to 249,000 in 1925.

The Correct Basis for Pension Systems

The reason for failure of numerous pension systems to operate successfully and a suggestion for the true basis and correct principles of such plans will be obvious if we isolate the case of a single pensioner, who, we will assume, has been in the employment of a company for 30 years and who has reached the age of 65 years. If an agreement has been negotiated with an insurance company to carry the pension payments after the date of this employee's retirement, the agreement has been worked out by the computation of annuities. In other words, it would be necessary to determine what annual premium must be paid from the date of agreement, say 30 years before the expiration of the pension qualification period, fixed by the insurance company after computing the average life expectancy and the compound interest earned by the premiums during 30 years. Now if the corporation wishes to put into effect a dependable pension plan, it must proceed along lines exactly analogous to those followed by the insurance company. An amount must be estimated for annual appropriation by way of reverse (corresponding to the premium), which, compounded, will carry the pensioner from the time of his retirement until his death. The most important element contributing to the solution of the problem is the interest. Analysis will demonstrate that for every dollar appropriated by the corporation as reserve, almost two dollars will be earned by compounded interest. This plan has the advantage of flexibility in respect to fluctuations in payroll, since an increased annual appropriation corresponding to the increase in payroll may be made at any time.

In the case of a large steel company, when the pension plan was adopted the complete liability for the amount of pension for each employee was set up on the books, although no sinking fund has been set aside to take care of maturing pension obligations. Although the recommendations of pension authorities that such reserves should be established have been considered, the pension committee and the controller agree that this is not essential in view of the very large earnings of the company.

In view of the general lack of appreciation among the industrial executives of the ultimate cost of pension plans, it may be of interest to offer some observations, based partly upon the limited American experience and partly upon the longer European record.

1. The total pension cost for any one year will not reach a maximum until the youngest employee at the time of the beginning of the plan reaches an extreme old age. In other words, the annual cost, apart from any increase in the number of employees, will show a continued increase for some 60 or more years after the origin of the plan. This is due partly to the longer service records of the younger men who eventually reach the retirement age, and partly to the effect of higher wage scales as the business grows.

2. At the maximum, the pension cost will be about 10 per cent of the annual payroll, assuming that present tendencies in the rate of turnover will continue. Some municipal pension funds which have been in operation a long time require an annual appropriation in excess of 20 per cent of the current salary list. The present experience of American pension plans, whereby a yearly appropriation of about 1 per cent of the annual payroll is adequate to meet current requirements, will most certainly prove an unreliable criterion in the future.

3. An annual appropriation of 1 per cent of the payroll will probably prove sufficient to pay all current pensions and provide an adequate fund for the future, including allowance for growth in number of employees and wage increase, if it is made effective when the business begins. But as most pension plans are started after the concern has been in existence a certain period, the 1 per cent appropriation takes care of the present and future only. The accrued liabilities of the past must also be taken into consideration if the reserve fund is to start on a solvent basis. An initial reserve appropriation of about 50 per cent of the current annual payroll will be necessary for this purpose.

4. An annual appropriation of about 2¾ per cent of the payroll is a fair estimate of what is necessary to meet current pension requirements and build up a fund for future needs in the case of companies which have been established for many years.

Establishing a Dependable Pension System

In the first place, a comprehensive analytical survey by an actuary or statistican is necessary to determine the rate of increase in pension liabilities from the beginning of the pension qualification period to the date of inception of the plan. This rate must be projected into the future to determine the approximate rate of prospective increase. The first years that a pension plan is operated show a comparatively low pension cost relative to the amount of payroll. As the pension plan is applied year after year, the increase in numbers of employees qualifying for the position is relatively much greater than the increases in payroll. It is apparent that provisions must be made at the inception of the plan for taking care of this increase in the number of pensioners. Various plans have been suggested, but none of them, excepting those which have been prepared in accordance with insurance methods, have been effective.

In order to devise an accurate, mathematically scientific system for a group, it is necessary to consider the factors of labor turnover and life expectancy at the age of retirement, in the light of the insurance mortuary tables. Although it is impossible to figure turnover with a degree of certainty that could be relied upon in respect to mortality percentages, a company during the first year of existence should establish the practice of setting aside a sufficient pension reserve and of permitting it to increase at compound interest, to provide for all eventualities including turnover.

If a corporation, through lack of understanding of sound pension procedure, has got into deep waters, it will at least be possible to apply correct principles in the development of a new or revised plan. Usually a three phase problem is presented, embracing qualified pensioners, those employees whose qualification periods are in process, and employees who will qualify in the future.

Scientists to Study Limestone Formation in Bahamas

A small party of scientists including Professor Richard Montgomery Field of the Princeton University geology department, Doctor William Beebe, of the New York Zoological society, and Doctor Charles Fish, director of the Buffalo Society of Natural Sciences, are planning a trip to a natural marine laboratory where limestone is in the process of formation. The location is the ocean area off the west coast of the island of Andros, in the Bahamas.

The expedition, which will probably start early in the winter, is the result of a preliminary survey of the locality made last winter by Professor Field. This survey convinced him that conditions similar to those of paleozoic times were being reproduced and that limestone was being formed there from a sedimentation of calcium carbonate. By studying conditions in the marine flat in the Bahamas, the scientists hope to find the origin of pure unfossiliferous limestone stratas such as are found in mountainous regions. This marine flat which is 300 miles long, 60 miles wide and is nowhere more than 25 feet deep, will be examined with the help of diving equipment.

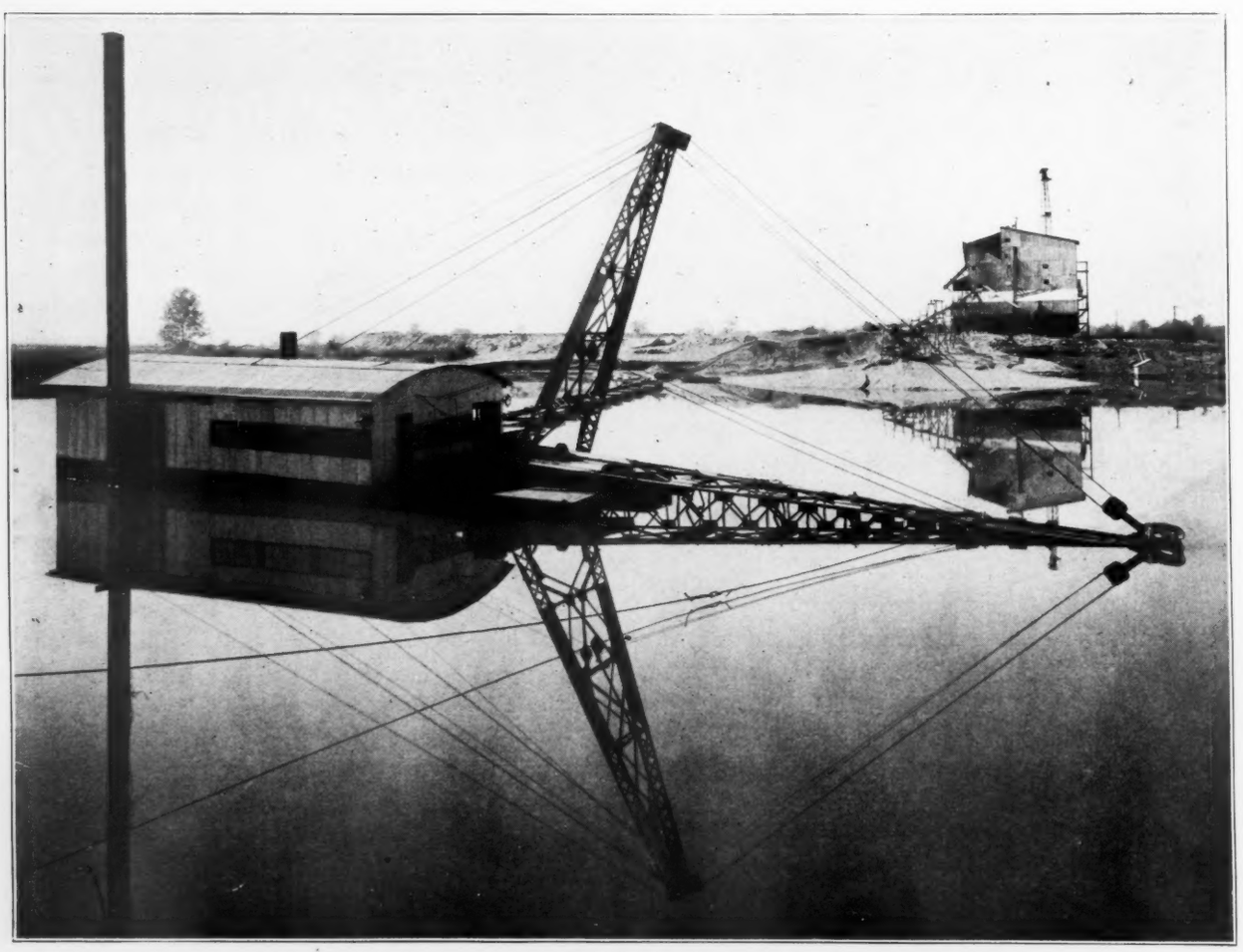
DREDGE AND CABLEWAY UNIT COMBINED BY MEROM GRAVEL COMPANY

FLEXIBILITY of a distinct character has been effected in the present plant of the Merom Gravel Company. The F. M. Welch Engineering Service merged two separate plants into one unit, the result being a combination dredging and cableway plant of proven effectiveness. A dredge is used for excavation and the material is pumped to a sump where it is reclaimed by a Sauerman aerial cableway and elevated to the washing and screening plant.

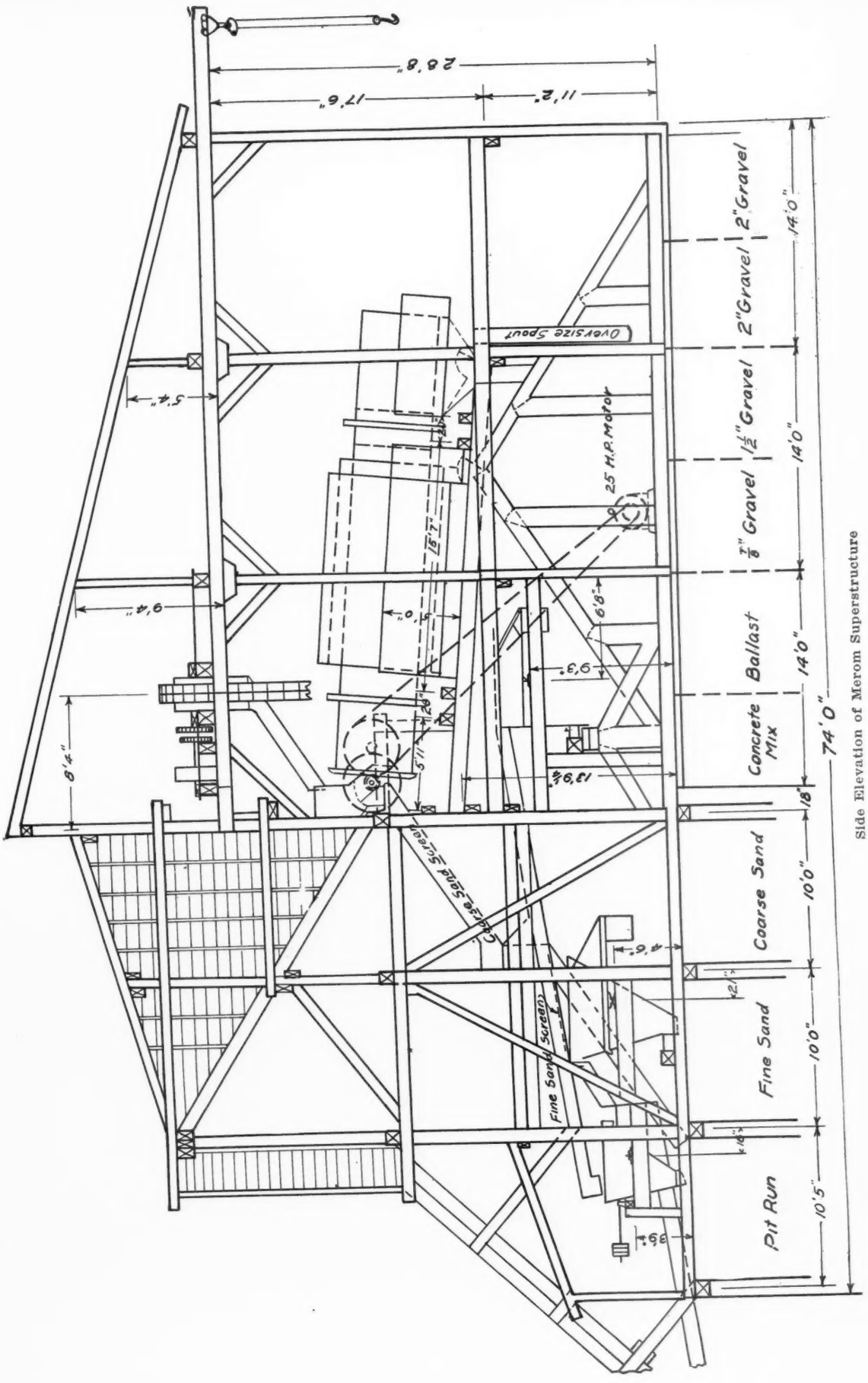
In 1893, the Merom Gravel Company began operations in the Wabash Valley below Merom, Indiana. In time, two individual plants were in operation. During last year these two plants were merged into the present unit by the F. M. Welch Engineering Service in cooperation with Ben Stone, general manager, and Fred Heim, superintendent of the Merom Gravel Company.

The dredge boat, which is of wooden construction, has a side intake and side discharge. Two spuds are used to anchor the boat and at the time one is down and being used as an anchor and pivot for the movement of the boat the other is up, permitting the free desired action of the boat. This causes the advance of the dredged face to resemble a crescent. A 12 inch Amsco centrifugal pump, driven by a 2200 volt, 3 phase, 60 cycle, 350 h.p. General Electric motor is mounted on the dredging unit for excavating. Two 2 inch Worthing pumps, each direct connected to 12 h.p. Allis Chalmers 240 volt motors, are used for priming. An agitator, which is a circular cutter head revolving clockwise on a 5 inch shaft, designed by the Welch Engineering Company, is used to cut the bank and feed the nozzle of the dredge pump. The hoist is of similar design and manufacture, and is operated by a General Electric motor with solenoid brakes. Power at 2200 volts a.c. for the entire operation is furnished by the Indiana Service Corporation.

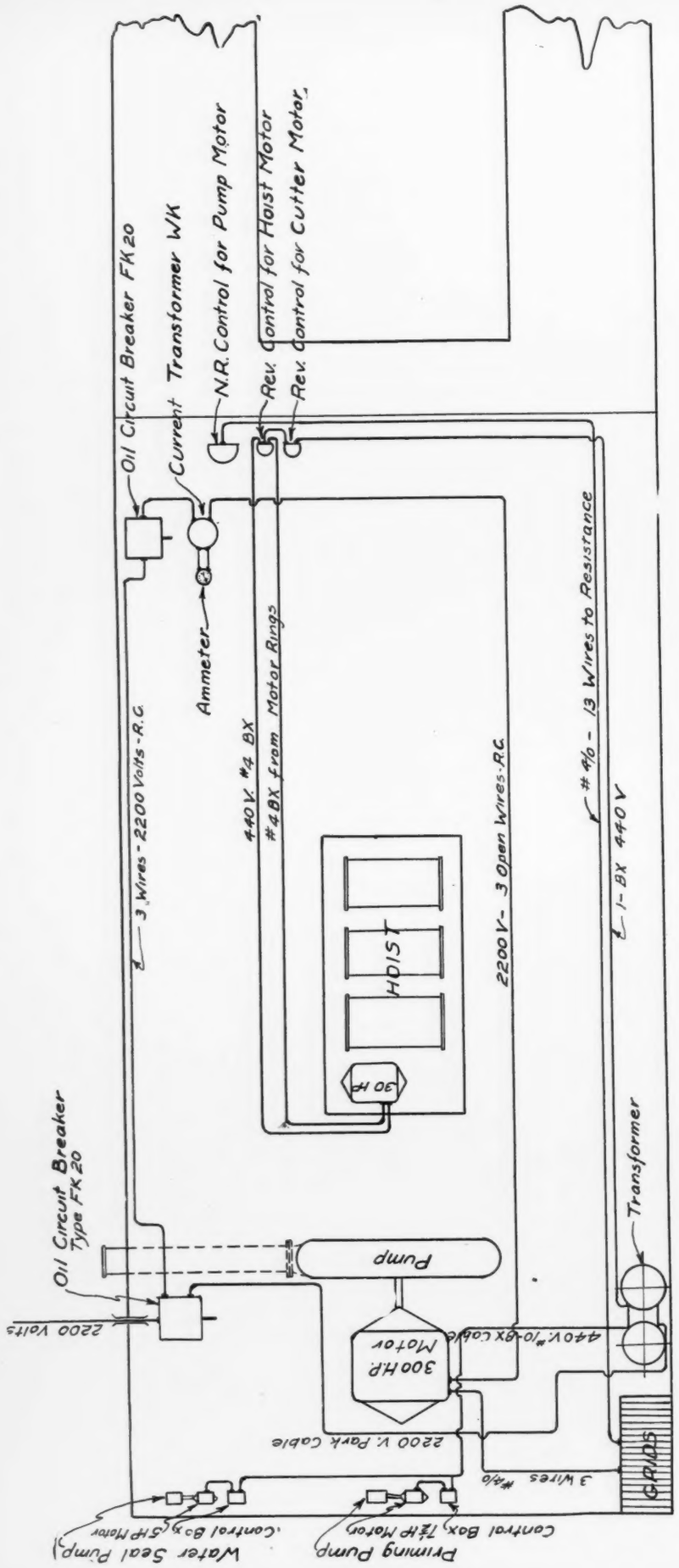
For the dredge boat, the power at 2200 volts is conducted by Rome super-sleeve conduits, directly to the dredge pump and a line runs to Packard transformers. The latter is stepped down to 440



View of Dredge With Cableway Plant In Background



Side Elevation of Merom Superstructure


Oil Circuit Breaker FK 20
Current Transformer WK
N.R. Control for Pump Motor
Rev. Control for Hoist Motor
Rev. Control for Cutter Motor
3 Wires - 2200 Volts - R.G.
Ammeter
440 V. #4 BX
#4 BX from Motor Rings
2200 V - 3 Open Wires - R.G.
#4/0 - 13 Wires to Resistance
1 - BX 440 V
HOIST
30 H.P.
Oil Circuit Breaker Type FK 20
2200 Volts
Pump
300 H.P. Motor
440 V. #10 - 8X cable
Transformer
2200 V. Park Cable
3 Wires #4/0
GRIDS
Water Seal Pump Control Box 5 H.P. Motor
Priming Pump Control Box 7½ H.P. Motors

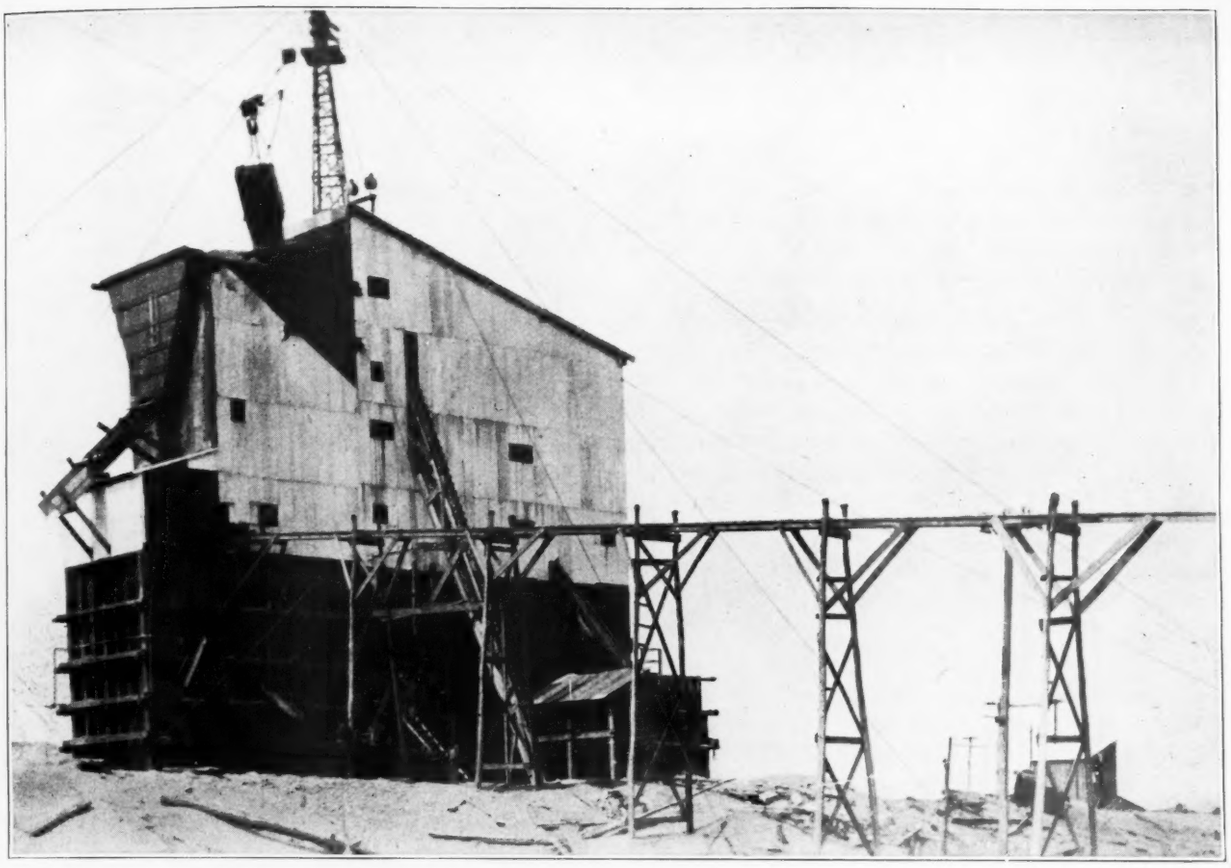
Wiring Details Merom Pump Boat

volts for the priming pumps and hoist, and to 220 volts for lighting the boat.

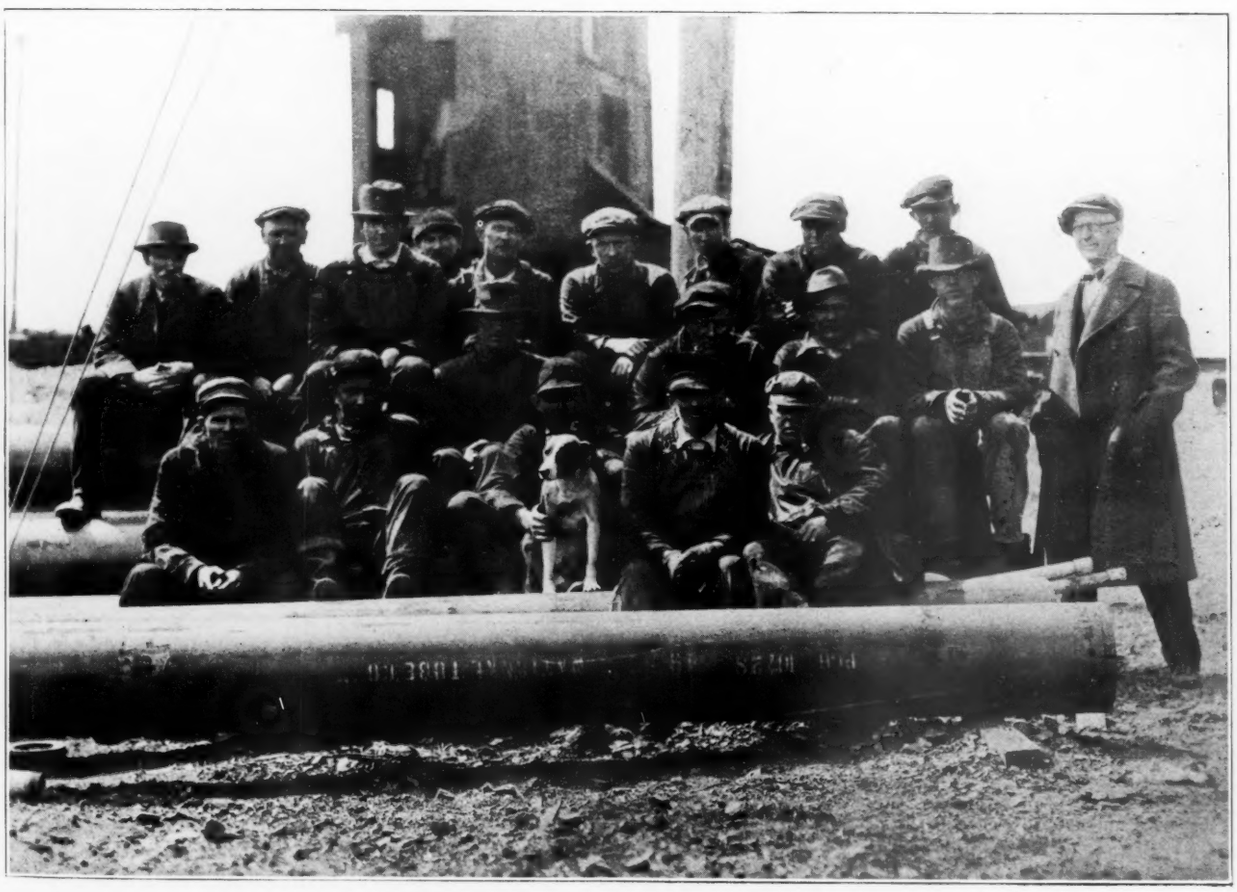
The discharge pipe is carried on steel pontoons to within 250 feet of the washing and screening plant and discharged to a sump. In this instance, the sump is of one compartment and material is being continually deposited and removed. From the sump, the material is taken to the washing and screening plant by a 2 yard bucket with a patented dumping device operated by a Sauerman slackline cableway on a 110 foot steel mast. The cableway is operated by a 150 h. p. Thomas electric hoist.

The material is dumped from the bucket onto a bar grizzly spaced at 6 inches and enters a two way chute where a gate allows the run of the bank to go for railroad ballast after washing or over a 30 degree stationary gravity screen for taking out the finer particles and beginning the washing process for disposition to the bins. It then passes into a scrubber which is a part of the Greenville screening unit. Water for washing is pumped to the top of the plant by two De Laval single stage centrifugal pumps, the one a 6 inch on an 8 inch line and the other a 4 inch on a 7 inch line, giving an abundance of water at all times for properly washing and cleaning the product. It passes from the scrubber into the Greenville double jacket screen which takes out the numbers 8, 10 and 14 sands and the gravel, as at present operating, of $\frac{5}{8}$, $\frac{7}{8}$, $1\frac{1}{2}$ and 2 inches. All jackets are adjustable to produce gravel as required. The scrubbing and screening unit is driven by a 30 h. p. General Electric motor.

The material is passed through chutes to the 10 bins from which the different sizes are drawn. Gates or valves are



Close-Up of Cableway, Screening and Storage Plant



The Plant Crew With Ben Stone at Right

installed in each of the chutes so that any desirable combination may be effected and any bin may be used for a special combination to supply a special demand.

The sand is taken from the screens by an elevator to an automatic settling tank on fulcrum bearings and the finer sand passes into a number 2 Telsmith sand tank for dewatering and passes to its respective bins.

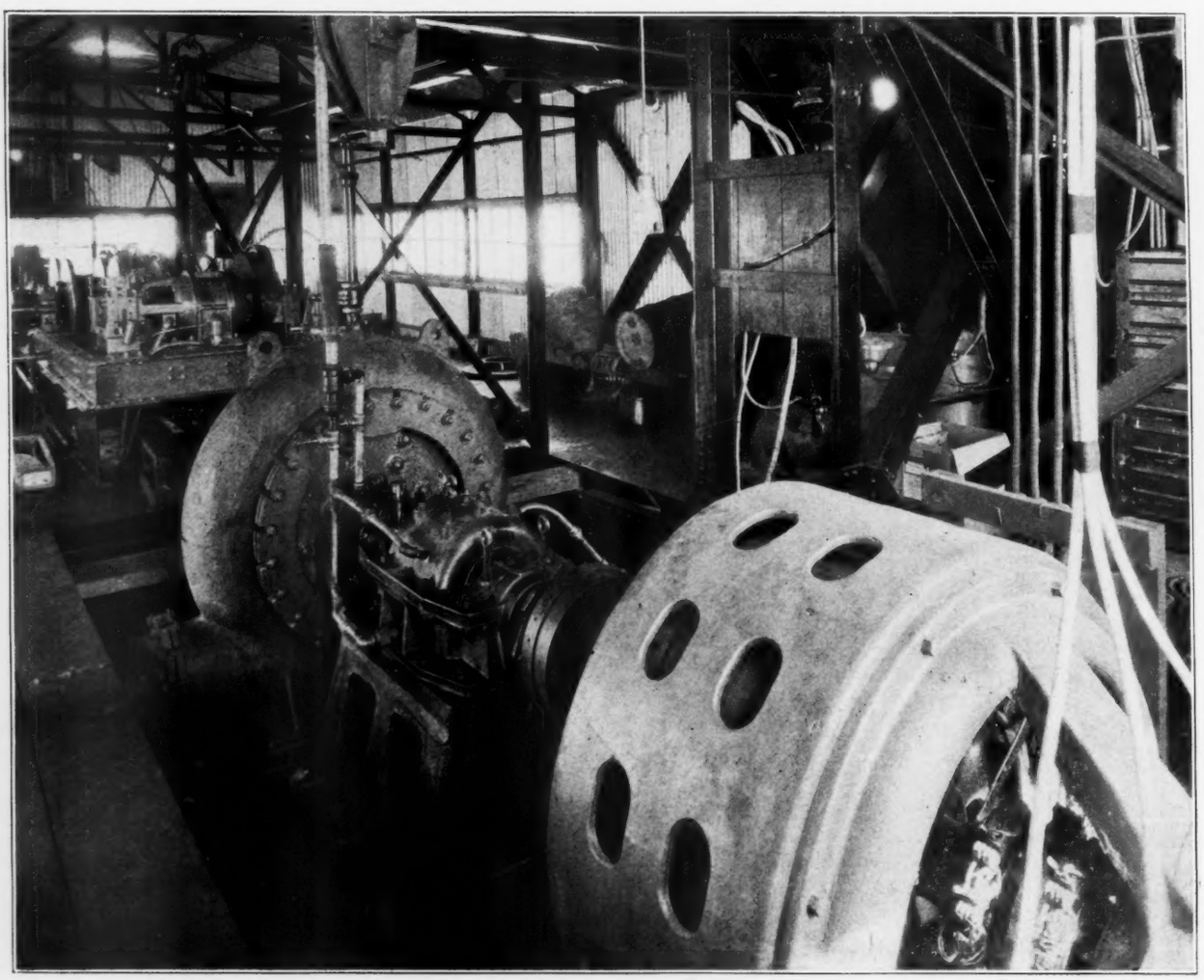
The oversize from the revolving screens is passed through a chute to a bin and when 50 tons have accumulated the belt driven 3 D Gates gyratory crusher, which is operated by a 30 h.p. Wagner motor and located in a building for the purpose, is started. The crushed material is taken by a bucket elevator to the scrubbing end of the unit and joins with the other material to be cleaned and sized. After passing through the plant, the water used for cleaning flows through a sluiceway and returns to the lake.

Power for operating the washing and screening plant is received at 2200 volts by a stack of Packard transformers, which are installed in a building provided for the purpose. It is then stepped down to 440 volts and used as alternating current on all motors about the plant. Motors are 3 phase, and 60 cycle, operated through automatic switchboards.

When production exceeds the demand, stockpiles are formed of the different sizes. Railroad cars are loaded from the bins which are becoming congested and dropped down to a position for unloading and an Orton Steinbrenner one yard clamshell is used to make the stockpiles. The clamshell is used for reclaiming the material as justified by the demand.

To accommodate the plant, which has a capacity of 50 cars per day, five tracks have been laid on the property. Shipping facilities are provided to reach the Illinois Central, Pennsylvania, Big Four and Baltimore and Ohio railroads. The plant is located in what is known as the Indianapolis District and on the Illinois Central Railroad.

Present officials of the company are S. B. Koehne of New York City, president; John E. Hollett, secretary and treasurer; Ben Stone, general manager and sales manager; and Fred Heim, superintendent. The rebuilding of the plant really began in 1921 after Mr. Stone became general manager. He was formerly secretary of the Illinois Crushed Stone Association after having served several years in different capacities for a large railroad system.



Interior View of Dredge

INTIMATE NEWS OF MEN AND PLANTS

New Arkansas Plant

The Ideal Cement Company recently announced final plans for the construction of a new cement plant five miles south of Schaal, Howard County, Arkansas. As a preliminary step the Grayson, Nashville and Ashdown Railroad has been purchased and a five mile branch line from Schaal to the plant is to be constructed. When this track is laid work will begin on the plant which is to have a 200,000 barrel capacity. Total expenditures are expected to be about $2,000,000.

Largest Boat on Lake Carries Limestone

The steamer Carl D. Bradley docked at the Buffington, Indiana, harbor of the Universal Portland Cement Company on July 27 with 16,033 gross tons of limestone from the Michigan Limestone and Chemical Company's quarries at Calcite, Michigan. This steamer is the largest and fastest on the lakes and, according to William J. McLean, captain, had the largest cargo of any kind ever carried on the Great Lakes. The Bradley is equipped with automatic electrical machinery which discharges its cargo at the rate of a ton a second.

Idaho Cement Company To Build Plant

The Idaho Portland Cement Company of Pocatello, Idaho, recently incorporated, plans to build a cement plant at Inkom, twelve miles southeast of that city. The plant is to be built at an expense of about $1,000,000 and $500,000 capital stock has been authorized.

Officers are: E. J. Simons, president; J. Tom O'Brien, first vice president; D. B. McNeill, second vice president and general superintendent; J. B. Maxfield, secretary and purchasing agent; and A. H. Greisser, engineer. Messrs. McNeill, O'Brien, and Maxfield are also officers of the International Portland Cement Company, of Spokane, Washington.

New Montana Gravel Pit In Operation

The Horton gravel pit about ten miles west of Miles City, Montana, has begun operations after a delay of nearly a month. The plant was to have begun operations on June 20 but a part of the plant and 500 feet of the trestle were blown down by a severe storm, delaying the opening.

Pioneer Lime Producer Passes

Mrs. Henriette E. Roth, president of the Sheboygan Lime Company and one of the early settlers of Sheboygan, died recently in her home opposite the Pine Woods on Calumet Drive. Funeral services were conducted by the Reverend Marion R. Brandt of the First Congregational Church while relatives and friends paid their last respects to one of the early successful business women of the country.

Mrs. Roth became president of the Sheboygan Lime Company on the death of her husband, Henry E. Roth, in 1887. She was continuously active in the management, having attended a meeting of the board of directors on July 16. She was also president of the Roth Building Supply Company since 1920 and was interested in a number of enterprises requiring judgment, foresight and vision.

Henriette E. Roth was born on January 14th, 1841 in Warnitz, Germany, and came with her parents to Sheboygan when she was 11 years old. On September 5, 1860 she was married to Mr. Roth, whose first wife, a sister of Mrs. Roth, had died leaving four small children. Nine additional children were born to this union, of which one died in infancy, making twelve children who attained maturity under the care of Mrs. Roth. She is survived by three daughters, two sons, twenty-two grandchildren and nineteen great-grandchildren. Thus a long and really worthwhile career has come to a close, but leaves marked evidence that it is possible to be both a devoted mother and a successful business woman.

New Indiana Plant To be Built

The Peru Gravel and Sand Company, of Peru, Indiana, recently incorporated, plans the construction of a sand and gravel plant on a 24 acre site on the Wabash river. A cement products plant will be operated in conjunction. Charles F. Welsh, Herbert L. Howard and Russell S. Rhodes are backing the project.

Texas Lime Plant Being Built

W. D. Hayden and Company of Houston, Texas, will build a plant for the manufacture of lime from oyster shell on the north side of Greens Bayou near Houston, at a cost of about $350,000. The plant site consists of 27 acres of land. The plant will be of the rotary kiln type and the first unit will have a capacity of from 60 to 75 tons daily. A second unit is contemplated as soon as the first is put into operation. The Missouri Pacific Railway, owner of the Houston-Goose Creek Interurban line which runs near the plant, is building a spur track to the plant site.

F. A. Kuntz Shoots Blast

The Frank A. Kuntz Limestone Quarry at Centre Valley, Pennsylvania, on July 17th shot a blast in which more than 10,000 tons of stone were loosed. 2050 pounds of Du Pont Quarry Gelatin dynamite was used, in 60 and 40 per cent strengths, in nine 6 inch by 41 foot well drill holes.

The blast was a hazardous undertaking because of the fact that the breast of the quarry was less than 100 feet from the crushing plant. No harm was done, however, to either the plant or surrounding property. C. W. Weaver of Easton, a Du Pont expert, was in charge.

The Kuntz farm contains a deposit of 50 acres of limestone. The quarry is on the state highway leading from Allentown and Bethlehem to Philadelphia in the Saucon Valley.

Michigan Sand Company Buys Property

The Manistee Sand and Dock Company of Manistee, Michigan, which was recently incorporated and is controlled by the Construction Materials Company of Chicago, purchased 80 acres of land in Manistee County from the Hubbell Sand Company, also of Manistee. Sand will be shipped by boat. J. R. Senisbar of Chicago is president, Harris E. Galpin, Muskegon, is vice president, and George A. Johnson, of Manistee, is secretary-treasurer.

Illinois Gravel Firm Expands

The H. D. Conkey Company, operators of a gravel pit near North Aurora, Illinois, recently purchased a 110 acre farm which will be added to the present pit.

West Virginia Sand Company Expands

Hiram A. Carpenter of St. Marys, West Virginia, recently purchased Grape Island in the Ohio river near St. Marys and will use it to furnish sand for his sand company. The island contains about 50 acres.

New Illinois Plant Installs Boat Freight Service

The Lockport, Illinois, plant, also known as the Paul Ales plant, of the Material Service Company of Chicago, has been reconstructed and will have a capacity of 3,000 yards a day. The new plant is now being equipped to load sand and gravel on a boat in the canal for shipment to Chicago. This boat, which was recently completed, is a new type and is designed to permit navigation under the stationary bridges spanning the river. It is of steel construction, has a cargo capacity of 2,500 tons and was built at an expense of approximately $250,000. The new freight service will begin about September 1st.

Paul Ales will be manager of the plant at Lockport. Officers are: Henry Crown, president; Irving Crown, treasurer, and John Guthknecht, secretary.

Plan Kentucky Asphalt Plant

Asphalt deposits on 7,500 acres of land in Grayson County, 4 miles southeast of Leitchfield, Kentucky, are to be developed and a $2,000,000 plant constructed to handle 30,000 tons daily. The chief product will be German motor dyes. Paving materials and other products are also planned. Veins of asphalt ranging from six to forty feet in thickness have been found at depths of four to thirty-six feet under the surface.

Foreign and eastern capitalists are backing the project and are represented by W. A. Batten of Owensboro. Test holes have been drilled and development is going on under the direction of W. O. Kruger of New York City, who is engineer for the interests.

New Corporations

Pollard Cyanite Co., Burnsville, N. C. $1,000,000. J. A. Pollard, Pres.; E. H. Pollard, L. V. Pollard.

Lime Products Co., % Fellenz & Mount, Plankinton Bldg., Milwaukee, Wis. $50,000. Benj. F. Siegert, Esther A. Siegert.

Southern Lime Products Co., % Geo. B. Gifford, Wolvin Bldg., Duluth, Minn. 3000 shares n.p.v.

Producers Sand & Gravel Co., Seattle, Wash. $50,000. J. L. Davidson, E. P. Whiting. (R. J. Meakim, Attorney, Dexter Horton Bldg.).

Central Sand & Gravel Co., Portland, Ore. $5,000. Maude M. Shaw, Inez G. Goodridge, Flora L. Becker. (Hampson & Nelson, Attorneys, 800 Pacific Bldg.).

Camanche Sand & Gravel Co., % Lane & Waterman, 200 Citizens Bank Bldg., Davenport, Iowa. 1,000 shares n.p.v.

Saxton & Dickinson, Inc., Goshen, N. Y. $10,000. Claude H. Saxton, Olive R. Saxton, Goshen; Louis B. Dickinson, 56 Roosevelt Ave., Middleton, N. Y.

Baldwin Sand & Gravel Co., Elmira, N. Y. $15,000 pfd.; 350 shares com. (Mandeville & Personius, Correspondents, Elmira).

Texas Gravel Co., Slaughter Bldg., Dallas, Tex. $30,000. Tom L. Tipton.

Consolidated Asphalt Products Co., % E. J. Patelski, Attorney, 179 N. Wells St., Chicago. $500,000. Harry L. Dunn, L. M. Bolger.

General Asphalt Corp., 227 Rosemary St., San Antonio, Tex. $100,000. H. E. Wilcox, H. J. Wilson, D. A. Gregg.

Georgia Marble Co., Dallas, Tex. $10,000. W. E. Tate, Sam Tate, H. L. Litchfield.

Southeastern Consolidated Granite Co., % W. M. Person, 1835 New Hampshire Ave., Washington, D. C.

Memorial Studios, Inc., % W. M. Person, 2101 16th St., N. W., Washington, D. C. $2,200,000. To quarry granite and marble.

Clarendon Marble Corp., % P. S. Dudley, 5 Nassau St., New York City. $1,000.

Peedee Marl Exploration Co., Inc., % Orem T. Wharton, Dover, Del. $200,000.

Midland Slag Co., Midland, Pa. $150,000. W. H. Kilcawley, Youngstown, O.

Sunshine Quarries, R. F. D. 8, Sunshine Road, Springfield, Mo. $25,000. Edw. L. Jarret, 5243 Delmar Ave.; W. J. Johnston, S. C. Conway, H. B. Johnston, Mona F. Conway.

Bayou Sand & Gravel Co., Houston, Tex. 500,000 shares n.p.v. C. O. Woolsey, L. B. Jones, Freda M. Jones.

Kanagua Sand & Gravel Co., Toledo, O. $25,000. C. A. Zinn, W. A. Belt, Jr., H. R. Bloch.

Hiddenite Granite Co., % Corp. Trust Co. of Amer., Wilmington, Del. 10,000 shares com.

Crystal Silica Exhibits

The Crystal Silica Sand Company, of Los Angeles, California, announces that it is exhibiting in booth 457 in the Oil and Mines Division of the San Diego Chamber of Commerce. This exhibit in the Pacific Southwest Exposition at Long Beach, California, will include the different products of the Crystal organization. This exposition continues from July 27 to September 3 and Crystal issues an invitation to attend its booth. A moving picture of its modern motivated gravity plant, which should be of interest, will be shown daily at the booth.

Plan Pennsylvania Plant

The Philadelphia Transportation and Lighterage Company, Philadelphia, Pennsylvania, plans to build a complete sand and gravel plant at Paulsboro, New Jersey, with a minimum capacity of 1,500 tons per 10 hour day. Present plans call for a dredge with washing and screening plant on shore. The percentage of material under ¼ inch in the deposit is about 50 per cent, and the largest size product will be 3¼ inch. H. W. Peterson, 119 Walnut Street, Philadelphia, is secretary and treasurer.

Crystal Silica Forms Sales Organization

The Crystal Silica Sand Company of Los Angeles, California, announces the formation of a sales organization. It will be known as the California Silica Distributing Company with Paul Splane as president and general manager. All communications regarding building materials, stuccos, finish facings, art stone and blast sands should be directed to the sales organization.

New Hampshire Feldspar Plant Under Way

The Eureka Flint and Feldspar Company, which owns a plant at Trenton, New Jersey, has plans under way to build a plant at the mouth of Cold River, about 1½ miles from Bellows Falls, New Hampshire. The total cost is expected to be about $150,000 and includes a two story main building, 170 feet long by 80 feet wide, and a storage shed of equal size, as well as machinery and several smaller buildings. The location of the plant is on the Boston and Maine railroad. Products are to be feldspar, mica, rock quartz and other non-metallic minerals.

Kentucky Quarry Elects

L. T. Goodridge, general manager of the Bowling Green Quarries Company and the Southern Cut Stone Company of Bowling Green, Kentucky, was recently appointed president of both companies. He succeeds Henry F. Almstedt of Louisville, who has retired from active association, although he retains his controlling share of stock and remains a member of the board of directors.

Others officers elected were: R. N. Wheeler of Nashville, Tennessee, vice president in charge of sales; J. H. Pickles, of Bowling Green, secretary and treasurer; R. C. Thomas of Bowling Green, attorney counsel.

NEWS OF EQUIPMENT MANUFACTURERS

An Improved Safety Sheave

The Advance Foundry Company of Dayton, Ohio, is distributing a pamphlet describing the Advance safety sheave. This sheave is built in sections of standard construction, each section being composed of two primary units, the cradle ring and the cable ring, each of which is made in two halves which are joined together in assembly. The sectional construction permits any number of cables desired to be used by assembling together the required number of units.

The sheave permits safe operation under heavy load on elevators, mine hoists, in logging and dragline operations. The construction is such that the greater the load the more positive the grip of the pulley on the cable. Binding of the cable on leaving the sheave is said to be overcome, thereby eliminating undue wear and minimizing the danger of breaking the cable.

Diesel Type Oil Engines Described

The Buckeye Machine Company of Lima, Ohio, has published a 30 page illustrated booklet describing the Buckeye Diesel type two stroke cycle oil engines of from 50 to 300 horse power. The illustrations show the different sizes in operation on various kinds of work, cross-sections, a graph of oil consumption, and a section of the engine showing the lubrication system.

The engine has all working parts fully enclosed, is without outside control cases or gear boxes, push rods or other working parts, and will operate on all commercial grades of fuel or crude oil that can be used in any internal combustion engine. A description with photographs and cross sections of the working parts is included.

The main bearings are of the removable shell type, split at an angle so that wear can easily be taken up, and are easily replaced. The base is of the horizontal enclosed type with double walls supporting each main bearing and forming oil reservoirs. The cylinders are made of a special heat resisting metal and are supported on the base by bored openings. A water jacket surrounds the working barrel and both sides of exhaust ports.

The piston is hard, close grain cast iron, the piston rod is turned and ground to micrometer gauge, and the five piston rings are of close grained iron slightly softer than the cylinder metal. The ignition bowl is of electric furnace steel, annealed and heat treated and the entire casting is surrounded by a water jacket. The crankshaft is cut from a solid open hearth steel forging and has counterbalance weights fastened directly to the crank webs. The connecting rod is of the same steel as the crankshaft and is forged from a solid billet. The crossheads are of the box type with an adjustable shoe on the lower side and the crosshead pins are of alloy steel, heat treated, hardened and ground. The centrifugal type governor, self packing fuel service pump, auxiliary fuel tank, fuel oil service tank, fly wheels, clutch pulley and other parts are also described in detail.

A New Cable Clip

A cable clip with a considerably larger holding surface has been put into production, in a full range of sizes, by the Eureka Metal Products Corporation of North East, Pennsylvania. It is patented and, according to tests, has shown its ability to carry three times the maximum load of an ordinary clip and gives good results on wire rope and messenger strand. Besides giving a larger holding surface, it is said to save cable. The large surfaces of both the top and bottom plates are grooved for the lay of the cable, so that neither of the cables is gripped by the U-bolt.

This clip is extremely rugged, as it has only four parts, similar to the ordinary type of cable clip. This clip, according to the manufacturers, gives triple safety because of its triple grip, which is perhaps the most important feature. There is no restriction on the way in which these clips are placed on the cable or which way the U-bolt is turned. The clips can be staggered on the cable, or placed with the U-bolts all the same direction, and it makes no difference. There are no circle bends in the cable from the clips, and the U can be placed over the live cable with just as good results as when turned the other way.

Alfred V. De Forest Honored

Alfred V. De Forest, research engineer for the American Chain Company, was recently awarded the Dudley National Medal by the National Society for Testing Materials in recognition of his achievement in perfecting a non-destructive test for materials. By means of the device Mr. de Forest has developed, anyone using it can instantly detect the slightest flaw in a piece of material passed before the machine.

This device is a sensitive electric galvanometer which will detect a flaw no bigger than a pin head in a piece of steel six inches thick. In its operation the galvanometer is comparable to the x-ray. Many important applications of this machine await its production.

Mr. de Forest graduated from Massachusetts Institute of Technology in naval architecture in 1912. After one year with the New London Ship and Engine Company he became instructor in civil engineering at Princeton. Later he studied metallography at Columbia, then spent two years in the research department of the Remington Arms Union Metallic Cartridge Company. Since 1918 he has been chief research engineer for the American Chain Company and its associate companies, such as the American Cable Company, Page Steel and Wire Company, Manley Equipment Company, Reading Steel Casting Company, Dominion Chain Company, and others.

Du Pont Publishes Revised Blasters' Handbook

The Explosive Department of E. I. du Pont de Nemours and Company has published a new and revised edition of the "Blasters' Handbook." The volume, which contains 214 pages and is pocket size, was prepared under the direction of Arthur La Motte, manager of the Technical section.

New matter appearing in this edition includes a section describing the character and uses of pellet powder in coal mines. This powder is comparatively new to the United States. The low density extra dynamites, designed for use in blasting soft ore, soft limestone, salt, gypsum and clay, and Agritol, a similar explosive for agricultural blasting, are also described.

A new type of delay electric blasting cap and examples of the method of calculating the electric current required for firing various types of blasting circuits are included in the section on electric firing. The sections devoted to ore mining, coal mining and tunneling have been revised to include new practices. Methods of safeguarding electric firing underground against the hazards of premature application of current to the blasting circuit and of the passage of stray current into the circuit are also presented in the handbook.

Fairfield Engineering Makes Improved Idler

The Fairfield Engineering Company of Marion, Ohio, has begun production of a new belt conveyor idler for which lifetime service is claimed. The idler was designed by Earl D. Stearns who recently joined the organization as vice president of the Stearns Conveyor Company of Cleveland.

DeLavaud cast iron pipe, a centrifugally cast pipe which is very dense and close grained, is used in the roller. Due to uniform wall thickness and trueness to shape the roller runs without vibration. Timken bearings are used throughout and lubrication is of the direct, high pressure type. All grease pipes are extended, making the connections easily accessible and a four pass, dust proof labyrinth grease seal prevents throwing of grease.

The rollers are interchangeable, the bearing adjustment is positive, and the rollers do not lose adjustment when removed from the brackets. Heavy cast iron brackets hold the idler in place and are mounted on a self-cleaning angle base. The return rollers support the belt 1½ inches above the bottom flanges of the stringer channels, giving good belt clearance.

A Truss Wheel Three Way Dump Trailer

The Athey Truss Wheel Company of Chicago, Illinois, is distributing illustrated Bulletin number 102 describing the Athey Truss Wheel 3 way dump trailers. These trailers are made in two sizes, the 10 ton 4 to 5 yard capacity, and the 15 ton 7 to 8 yard capacity.

A feature of the trailer is the large diameter of the crawler wheels which enables it to surmount obstructions with a minimum of effort. The wheels are mounted on Hyatt roller bearings, lubricated by the Alemite system. The track shoes, trip chain bolt and link assembly, and track wheel spindle are of high carbon chrome alloy steel, heat treated, and the axles are of high carbon steel. The drawbar jack is a quick acting ratchet type with control mounted on top of drawbar frame and the drawbar coupler is of the spring cushioned swivel type. Both models have a wheel base of 10 feet 2 inches. The 10 ton size has a loading height of 62 inches, turning radius of 9 feet 6 inches and a supporting surface of 9 square feet, while the 15 ton has 75 inches, 12 feet, and 12 square feet respectively.

"Commercial" 3 way dump bodies are used, having an overall length of 136½ inches on both models. The 10 ton body has a width of 98 inches, height of 33 inches and depth of 23 inches, while the 15 ton has a width of 102 inches, height of 45 inches and depth of 35 inches. Rear dumping angles of both are 60 degrees and the side dumping angles are 52 degrees and 48 degrees respectively for the 10 and 15 ton. Dumping positions are selected by a lever located on the front of the body and the dumping is controlled by the tractor operator. The gates open and close automatically and are completely open at a lift of 16 degrees. Material is dumped clear of the wheels and a special bottom is made for use in hauling rock.

The direct lift, double cylinder "Commercial" telescoping hoist with a stroke of 34 inches is driven by a hydraulic pump with power take off mounted on the rear of the tractor and connected by a detachable metallic hose. A 10 gallon oil supply tank is mounted directly above the pump. The hoist is self aligning and has its cylinders mounted on a steel arched casting operating on double oscillating trunnions at top and bottom. Westinghouse air brake equipment is optional.

Smith Purchases Watson Wagon

The Smith Trailer Corporation of Syracuse, New York, has purchased the tracings, prints, patterns, and templates of the Watson bottom dump tractor wagon from the Rex Watson Corporation of Canastota, New York. The Smith Corporation will continue to manufacture similar wagons which will be known as Smith trailers. Models R-3 and R-6 will be equipped with round wheels and models C-7 and C-10 will be equipped with crawler wheels.

Harold P. Bentley, formerly production manager for the Watson Corporation, will be in charge of production. R. Shaw Goldthwait, formerly sales manager for the Watson Corporation, will direct sales under the new arrangement.

Hydraulic Stripping Nozzles Described

The Universal Nozzle Company of Indianapolis, Indiana, makes a stripping nozzle for stripping overburden, washing down sand or gravel banks and making cuts or fills. These nozzles are made of cast bronze throughout except the discharge pipe which is seamless steel tubing and the operating lever which is cold rolled steel. It is ball bearing, has no joints, bolts or other obstructions in its waterways, does not leak under pressure nor have to be staked down or anchored in any way and is easily operated by one man. Its universal movement gives it a great effective range, allowing the stream to be directed to any point in the compass except immediately under the base of the nozzle without the use of hose or a ball and socket joint. The base consists of an extra heavy, long sweep cast iron elbow bolted to a plank support. No other stabilizers are needed as the pump is always in perfect balance.

Four sizes of nozzles are made for different conditions. For pressures up to 250 pounds at the nozzle the standard Type A is generally used. This nozzle has a 4 inch inlet and is furnished with 3 discharge tips, 1⅛, 1¼ and 1½ inches in diameter. The standard Type F is made with a 3 inch inlet, and tips 1, 1⅛ and 1¼ inches in diameter. For pressures above 250 pounds the heavy duty Type H is generally used. It is of the same capacity and size as the Type A except that it is of heavier construction. For hydraulic mining, or other operations where a still larger volume of water is required, a Type O nozzle is made with a 6 inch inlet and a 6 inch discharge pipe tapering to 3¾ inches where the discharge tip is attached. Tips up to and including 3 inches in diameter are furnished to fit conditions.

Scrapers and Excavators

The Atlas Conveyor Company of Philadelphia is distributing an 8 page August Bulletin which illustrates and describes its cable power scrapers and slack line excavators. The drawings which show different methods of storage and systems of operating are of considerable interest. Photographs of actual operations and tables of duties together with the construction of the different equipment manufactured by the company are given in the bulletin.

A Direct Current Brake For Cranes and Hoists

The Electric Controller and Manufacturing Company of Cleveland, Ohio, is distributing an illustrated folder describing the E. C. and M. Type WB direct current, shoe type brake for cranes, hoists, steel mill machinery and similar applications. The construction is so simple that by turning a nut which compresses the brake spring the armature can be lifted out. The brake shoes are removed for relining by the same method. Moulded asbestos blocks are used on the brakes with rivet holes moulded and countersunk in them.